

ELEVENTH ANNUAL REPORT

OF THE

PENNSYLVANIA

DEPARTMENT OF AGRICULTURE.



1905.

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HARRISBURG PUBLISHING CO., STATE PRINTER.
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PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

OFFICIAL LIST.

N. B. CRITCHFIELD, *Secretary*,
Stoyestown, Somerset County.

A. L. MARTIN, *Dep'y Sec'y and Director of Farmers' Institutes*,
Enon Valley, Lawrence County.

M. D. LICHLITER, *Chief Clerk*,
Allegheny.

E. C. FIRST, *Stenographer*,
Harrisburg.

GEORGE F. BARNES, *Messenger*,
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West Chester, Chester County.

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H. A. SURFACE, *Economic Zoologist*,
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NORMAN G. MILLER, *Assistant Economic Zoologist*,
Marion, Franklin County.

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KATHRYN P. FIRST, *Stenographer, Economic Zoologist*,
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LEONARD PEARSON, *State Veterinarian*,
Philadelphia.



ELEVENTH ANNUAL REPORT
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SECRETARY OF AGRICULTURE.

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Department of Agriculture,
Harrisburg, Pa., Jan. 1, 1906.

To His Excellency, Samuel W. Pennypacker, *Governor of Pennsylvania*:

Sir: In compliance with the requirements of the Act of Assembly, creating a Department of Agriculture of Pennsylvania, I have the honor herewith to submit my report of said Department for the year 1905.

EVIDENCES OF PROGRESS.

The best proof that progress is being made in any particular line of activity, is found in the eagerness with which those most interested are seeking information concerning its principles. That the number of young men in the State of Pennsylvania who are seeking a higher agricultural education is constantly increasing, is not only apparent, but is in the highest degree encouraging. The public demand that secured from the General Assembly of our State at its last two sessions, the appropriations necessary to erect and equip the magnificent Agricultural Building at our State College, was but the outgrowth of the earnest desire seen on every hand for a more general and thorough agricultural education. The demand for agricultural literature is constantly increasing. Agricultural journals are multiplying in number, and at the same time, are constantly improving in the character of the practical and scientific knowledge they place before the people. The call for an increased number of farmers' institutes, comes with the beginning of the institute season of every year, while those who are in a position to determine the trend of public thought, realize that a higher grade of instruction is required for each succeeding year, so that the lecturer who would maintain his reputation and position, must himself be a close and constant student. Farmers' organizations are increasing in numbers and activity. The discussions of farm topics at these meetings are constantly assuming higher rank and attaining a higher degree of excellence. A Stock Breeders' Associa-

tion, at the present day, thinks it no hardship to call the right man half way across the continent to talk upon subjects relating to breeds and breeding, while an eminently successful dairyman can name his own price to come from Wisconsin to Pennsylvania, to address an association of dairymen upon measures and methods to be pursued to make the dairy business profitable. The up-to-date farmer, of whom there are many, talks as intelligently to-day of cereal breeding as he does of breeding cattle or sheep. To him there is as much significance in the vigor and prepotency that may be bred into a variety of corn, as there is in the breeding of the same qualities into any variety of live stock.

All these conditions indicate that agriculture, the oldest of all industries, is become young again, and in the vigor of renewed youth, is making advancement that seems almost incredible.

The steady increase in crop production in the State also indicates improvement in methods employed. If Pennsylvania were a new State, increased production might be attributed to increased acreage, but in a State as old as Pennsylvania, there is not likely to be much change from year to year in the number of acres devoted to any given crop. The corn crop of 1905, notwithstanding the fact that in many parts of the State there was so much wet weather during the growing season, as to make the proper cultivation of corn impossible, was 8,450,155 bushels in excess of the production of 1904, the total crop for the year being estimated at 56,985,903 bushels against 48,535,748 bushels. The increase in the wheat crop over the production of 1904 was 6,002,710 bushels, the entire crop amounting to 27,860,671 bushels, against 21,857,961 in 1904. The production of barley in 1905 was 217,300 bushels, an excess of 12,680 bushels over previous year. The total number of bushels of rye grown in the State during 1905 was 5,886,505, an increase over 1904 of 519,397 bushels. The buckwheat crop shows a gain of 48,935 bushels over the year 1904, the entire crop amounting to 4,467,960 bushels. The production of hay in 1905 shows an increase over the former year of 108,607 tons, the entire crop being 4,608,032 tons. Of the leading farm crops, all show a gratifying increase in production, except oats and potatoes. The oat crop showed a loss of 281,494 bushels, while the loss in the potato crop was 4,332,536 bushels when compared with the yield of 1904. The loss in the oat crop was no doubt largely owing to the fact, that the long continued wet weather, which prevailed in many portions of the State during the period for harvesting oats, made it impossible to take care of the crop. In many sections, the ground at the time the harvesting should have been done, was so soft as not to permit going upon it with harvesting machines, and as the old process of cutting with the cradle is very nearly obsolete, a large per cent. of the crop was left upon the fields. The unusually wet summer also had an adverse influence upon the potato crop, as potato blight, which was remarkably prevalent in our State, may always be expected as one of the attending results of such a season.

DIFFICULTIES TO BE OVERCOME.

Chief among the hindrances to success is the scarcity of farm labor. From every section of the State comes the complaint of

scarcity of farm hands. Wages for farm labor in many communities, have increased 50 per cent. during the last decade, and yet the supply is nowhere near equal to the demand. This condition results largely from the rapid development of other industries. There was never a time in the history of the Commonwealth, when our people were making so determined a push for the rapid accumulation of wealth, as is being made at the present. The mineral resources of the State are being abnormally developed. Our great deposits of coal and iron are being taken from Nature's storehouse more rapidly than is necessary to meet the wants of the people, and instead of that economy, that philanthropic discretion would dictate, a degree of unnecessary consumption amounting to waste is encouraged. To move these mineral deposits and place them in proper form for market, as well as to prepare the means of transporting them to the places where they may be sold, requires the employment of more labor than has ever been found necessary in any period of the past. The search for cheap labor has taken the capitalists of the country into Southern Europe, and from countries where people are accustomed to live much more cheaply than is possible for our own people, immigrants are being brought to this country by multiplied thousands. For these people, homes of some kind, however rude and simple, must be provided, and so our forests are being cut down, and in many instances, timber that should be permitted to grow, so as to meet the wants of the generation that is coming after us, is being wasted by being turned to use before its time.

All this push and development has resulted in creating a greatly increased demand for clerks, salesmen, teamsters, foremen, etc., about public works, that has taken from the farms of the State our native farm help, and for this reason the Pennsylvania farmer is not in a position to secure his full share of the prosperity that the country at large enjoys.

HELPFUL AGENCIES.

State College and Experiment Station: Both the College and Experiment Station did excellent work during the year. The College has largely increased its facilities for conducting both its long and short courses in agriculture, and with these increased facilities, has come increased demand for a higher agricultural education. We are living in a practical age. The tendency is to educate people to do something rather than to know something, without connecting the thought of knowledge with that of action, and our State College is among the foremost institutions of our land in devoting attention to the subjects, upon which her students, when they enter upon active life, must depend for a living.

Until recently, agriculture at the college, for want of proper equipment, could not occupy the prominent place that both the Faculty and Board of Trustees desired that it should; but "the day of small things" is past, and now with magnificent buildings and splendid equipment, the College is prepared to do, and is doing, a great work for the agriculture of the State.

No less important aid than that coming from the College proper, has been afforded by the Experiment Station. The importance of experimentation as an aid to agriculture, has been recognized by

the people of this country from its earliest history. The journals kept by Washington and Jefferson, show the efforts they made to vary and increase production by experiment, and from their own day down to the present, many individuals, as well as farmers' clubs, have been pursuing the same course. The progress made, however, was necessarily slow until the subject was taken up by Congress, and the act of 1887 establishing experiment stations was passed. Since then, the progress made has been phenomenal. Experiments in the breeding and feeding of live stock, in the development of new varieties of cereals, vegetables and fruits, in the feeding of plants and the destruction of the diseases and insects that interfere with their growth, these and many other experiments have been going on, and bulletins of information as to results, are being scattered among the farmers of the whole country, so that the day can not be very remote when the farmer who reads, will know not only how to grow his crops most successfully, but will also know how to protect them against the insects and diseases to which they are subject. In all this work, our own experiment station has performed its full share, and now that our State authorities have come to recognize the importance of the work it is doing, and the policy that has from the beginning prevailed in other states, that of aiding the work by State appropriation, has been adopted by our State Legislature, our Experiment Station is destined to become still more efficient in the future than it has been in the past.

State Board of Agriculture: During the year, the Department has enjoyed the co-operation of the State Board of Agriculture, which has, in many ways, proved quite helpful. It is a very great advantage to the head of the Department to have located in almost every county of the State some one, upon whom he may call when necessary for assistance or information, who, on account of his known qualifications, has been chosen by his fellow-farmers to represent them upon this Board. This Board has proven its devotion to the cause of agriculture by a faithful continuance in its work, during the eleven years in which no appropriation was made to meet the expenses of its members. Its meetings have been well attended, and the intelligent discussion at these meetings of many timely and pertinent questions, relating to practical and scientific agriculture, have been a great help in the onward move toward better methods, better living and higher education and culture for the agricultural classes. The Board has called to its aid a corps of scientific specialists whose reports of researches made for the discovery of hitherto unsettled principles directly related to agriculture, are of great value. No recognition of merit was ever more worthily bestowed than that which was given to this Board by the last General Assembly, in renewing the appropriation to defray its expenses.

Other farm organizations, among which I may name the Grange, the State Live Stock Breeders' Association, Dairy Union, Horticultural Society, and Bee-Keepers' Association, have all in their respective lines, been doing most excellent work. Such associations should be encouraged in every way possible, for the more of these associations we have, within reasonable limits, and the better they are supported, the more rapid will be our advancement in agricultural knowledge and attainments.

County Fairs: Among the agencies helpful to agriculture during

the year, I feel that it is but just to name the county fair. I know that many worthy and intelligent people can see nothing good in a county fair, and I grant, that, conducted as many fairs are, the good is overshadowed by that which is only evil. This, however, does not prove that properly conducted fairs are not helpful. I regard the Agricultural Fair as an educator. I have never gone to a fair without seeing something that was new and that started in my own mind, a line of thought from which I gained something. At the fair you see what your neighbors are doing, and your attention is directed to their best efforts. When you see something a little better than the ordinary, in any particular line, you will be likely to question the producer concerning his methods, and whether prompted by what you see or what you hear, a line of thought is likely to be started that will lead to valuable experiment, and prove to you a decided benefit. It matters not what may be the line along which you are working, you want to have fixed in your mind some standard of excellence that you regard as desirable to attain. You go to the fair and you see your ideal. It may be an animal or a variety of fruit or vegetables, depending entirely upon the channel in which your individual tastes run, and when you get back to the farm, you think about it, your standard is fixed and you begin to work toward it.

I had occasion to speak of the improvement in the method of conducting county fairs in my last Annual Report, and it is gratifying to know that the same improved conditions were noticeable during the year 1905. I think that the theory held by many, that a county fair cannot be conducted successfully without admitting certain forms of gambling and inside shows and entertainments of questionable propriety, is about exploded and a better day, for a better and purer county fair, has been reached.

WORK DONE BY THE DEPARTMENT.

The specific work of the several Divisions of the Department was carried on during the year with the same vigor that characterized the work of each Division during the two previous years. I need not refer to this work in detail, as it is fully set forth in the accompanying reports of the heads of the respective Divisions. I desire, however, to express my very high appreciation of the intelligent effort made by each Division to make its work as valuable as possible to the State.

FEEDING STUFFS CONTROL.

The routine work of the Department coming more directly under the supervision of the Secretary, has gone forward during the year without particular incident. A number of prosecutions were brought for violations of the laws regulating the manufacture and sale of concentrated commercial feeding stuffs. The fines collected and turned into the State Treasury for violations of this law, occurring during the year 1905, amount to 2,900 dollars, and there are still a number of cases to be determined.

What is known as "Concentrated Commercial Feeding Stuff," have been in great demand in Pennsylvania and must continue so indefinitely. Our many large cities and populous mining districts

make dairying one of the leading farm industries of the State, and comparatively few dairymen can raise grain enough to furnish the amount of feed that can be profitably used. This creates a great demand for grain or cereal feeds that are especially rich in protein. It is unfortunate, therefore, that so many of these feeds are subject to adulteration, and in order to reduce adulteration to a minimum, the act known as the "Feeding Stuffs Law" was passed, requiring dealers in "concentrated commercial feeding stuffs" to attach to the package containing the feed they sell, a statement giving the name and address of the manufacturer, the weight of the package and the per cent. of crude fat and crude protein the feed contains. When these provisions of the law are observed, the detection of fraud is an easy matter, and whenever it is found, that the law is not complied with, or that an incorrect statement is given of the nutrient matter a feed contains, prosecution is instituted. The good effect produced by the enforcement of the law is quite apparent. A number of the manufacturers of these feeds, who formerly paid no attention to the law, are now marking their goods as the law requires, and in some instances, when conscience was awakened by the recollection of fines paid, agents were sent over the State to relabel goods, sometimes showing a reduction of from three to seven dollars per ton, in their value as estimated upon the first guarantee.

The Annual Feeding Stuffs Bulletin is now in the hands of the printer. This bulletin, in addition to showing the results of analysis of samples secured during the year, contains some very useful information concerning the relative value of standard feeds found upon the markets of the State, and some important suggestions designed to assist persons having the care of live stock in making intelligent purchases of the qualities of feed they need.

LINSEED OIL.

The Act of 23d April, 1901, to prevent the adulteration of, and deception in, the sale of linseed oil, was amended by the last Legislature, so as to provide the means for making it operative. The work of sampling oils and subjecting them to chemical examination was, therefore, taken up, and during the year 420 samples were secured and analyzed. It was an agreeable disappointment to this Department to learn what a small per cent. of the samples secured were adulterated. The few adulterations found were largely confined to "boiled oil." Of the 331 samples of raw oil, 6 or 1 8-10 per cent. of the whole number were adulterated, while of the boiled, the adulterations amounted to 8 per cent. The principal adulterants found to be used in these oils, were, mineral oil, gasoline, rosin oil, fish oil, and in some instances, a cheaper vegetable oil such as oil of cottonseed or corn. The great quantity of linseed oil that is used in paints applied to farm buildings, makes the quality of oil found upon the market, a matter of very great importance to farmers, and this may be the reason why the General Assembly has placed the duty of making these examinations and enforcing the law upon this Department. Some prosecutions for adulterations found have already been brought, and others will follow, until every clear case of adulteration is reached.

COMMERCIAL FERTILIZERS.

The examination of commercial fertilizers found upon the markets of the State, twice during each year, and the publication and distribution of the bulletins showing the result of these examinations, forms a considerable part of the work of the Department. Great pains is taken to secure as nearly as possible, samples of every brand of fertilizer sold in the State. For sampling purposes, the State is divided into fourteen districts, and an agent of the Department, commissioned and sworn to faithfully and impartially perform the duties assigned him, is put to work in each district, as nearly as possible at the periods when the fertilizers used for fall and spring seeding begin to move. Each agent is instructed to continue his work from day to day, until 96 samples have been secured, which usually requires about four weeks. The samples as collected are sent under seal to the chemist who makes the analysis, accompanied by a report giving full information concerning each sample, whereby its identity can be preserved, and a copy of the same report is sent to this Department, where a complete record of the history of each sample is kept.

As soon as the work of analysis is completed, a bulletin is prepared, giving results of analysis whereby purchasers may be advised concerning the quality and value of each sample analyzed. The Department makes every possible effort to get the bulletin of each season (spring and fall) printed and distributed before fertilizers to be used the following season are bought, so that purchasers may have the benefit of the information it contains to assist them in making their selection. In this we are not always successful, owing to the magnitude of the work to be done and the short time we have in which to accomplish it.

During the year 1905, the number of different brands of fertilizers taken by our agents was 986, and yet when we compare this number with the number of licenses issued to manufacturers to sell within the State, we find that only 86 per cent. of the whole number of brands sold in the State was secured. The very short period during the spring and fall seeding season of each year that fertilizers are to be found in the possession of dealers and consumers, and the limited amount of money that can be spent upon this work, render it impossible to make the work more complete. This work is accomplished without cost to the State, the money used being derived from the license fees paid by manufacturers.

The Act of Assembly regulating the manufacture and sale of commercial fertilizers requires, that every package of such fertilizers, sold, offered or exposed for sale within the Commonwealth, shall have plainly stamped thereon, the name of the manufacturer, the place where manufactured, the net weight of its contents and an analysis stating the percentage therein contained of nitrogen, in an available form, of potash, soluble in water, of soluble and reverted phosphoric acid and of insoluble phosphoric acid.

It is unfortunate that the Act does not require manufacturers to give, in addition to the foregoing information, a statement of the sources from which the several elements of the plant food they contain are derived. Phosphoric acid, as found in commercial fertilizers, may be derived from what is commonly known as South

Carolina Rock or from animal bone, basic slag, etc. The potash they contain may be derived from muriate or sulphate of potash, kainit, wood ashes, etc., while the nitrogen may be secured from tankage, dried blood, nitrate of soda, cottonseed meal or a number of other materials in which it is found. The readiness with which these fertilizing elements dissolve, when applied to the soil, depends largely upon the source from which they are derived; and in order to apply them intelligently to his crops, so as to secure the greatest benefits from their use, the farmer should know the source from which they come. This matter will be brought to the attention of the next General Assembly, and a plea will be made for the needed change in the law.

Some manufacturers burden the statement the law requires them to make, with superfluous information that is of no value and that many times leads to misapprehension on the part of the purchaser. Such additional statements should be prohibited, and nothing more than the statement now required by section one of the Act of March 25, 1901, should be permitted to be placed upon the package.

SUGGESTIONS FOR IMPROVEMENT.

The Farmers' Institute: I have already spoken of the advancement made in the increased efficiency of farmers' institute work. The progress made in this direction is phenomenal. During the first few years after the introduction of this work into our State, its friends could not avoid some apprehensions concerning the possibility of holding the work up to the high standard assumed at the very start. Farmers, as a rule, are good students and apt learners, and the question in the minds of many was, "Will it be possible always to secure lecturers and instructors that will be able to keep in advance of those who are to be taught?" The manner in which this question has been answered in Pennsylvania is gratifying to every one interested in agriculture. Institute instructors, from the very beginning, saw the necessity of keeping close up with the rapid progress that was sure to be made. The few who, either from lack of inclination or failure to realize the necessity, were not willing to labor for self-improvement, soon dropped out of the work and their places were taken by others more active, the new supply usually coming either as graduates or teachers from our own State College, or from some other institution of the same kind. The leaders in this work must be men thoroughly competent and well equipped. Not men, as is sometimes asserted, who are able to answer every question that may be asked, but men of sufficient mental calibre and training, to answer most reasonable and proper questions that are likely to be asked, and who possess sufficient discretion and common sense to say, when it becomes necessary, "I do not know." Such men are always in demand at good salaries, and if in the future, we are to keep on the upward move, as we have done in the past, our State law makers must be impressed with the importance of granting liberal appropriations to institute work. No surer indication of the prosperity of a State or Nation can be found, than the prosperity of its agriculture, and money expended to secure such prosperity is sure to yield a good return.

Teachers and Superintendents of Public Schools: Public school teachers and county superintendents of public instruction should

be interested in agricultural improvement. The work that is now being done in this direction by this Department, particularly through the Zoological Division, is of inestimable value. Bulletins of information on agricultural subjects should be secured by teachers, and at certain periods, as the school work progresses, the subjects of such bulletins should be taken up, one at a time, as a general exercise, in which the entire school should take part. The bulletin, if a short one, may be read by the teacher, and if too long for a single reading, a part may be read and such explanation as the teacher thinks necessary may be given. The pupils may then be asked to get from every source within their reach as much information as they can upon the same subject. As a general exercise for another day, the same subject may be taken up and the pupils examined upon it, calling out what they remember of all they have heard upon the subject, and their own impressions concerning it. Such exercises would be profitable as a means of dispelling the monotony of the regular routine school work, and would at the same time, awaken in the pupils an interest in such subjects, that would be carried into all the homes of the district, and that could not fail to produce good results.

If county superintendents of schools should secure such bulletins and send them to teachers in advance of the school visitations they make, asking the teachers to take up certain subjects in the way already described, and then at the time of visitation, if they should spend a few minutes in examining each school upon the subject assigned to it and giving some additional instruction upon it, the interest of the entire county would be awakened, which would lead to the investigation of other kindred subjects and incalculable good would be done.

A State Fair: The failure to secure legislation during the last session of our General Assembly, for the establishment of a State Fair, can not be regarded otherwise than most unfortunate. Pennsylvania, notwithstanding her great mining and manufacturing interests, stands among the very foremost states of the Union as an agricultural state, and for the credit of the Commonwealth, if for no other reason, she ought to maintain an annual fair worthy of the position she holds. The maintenance of such a fair would bring into our State exhibits of the best agricultural products, including live stock, of the whole country. A friendly spirit of emulation would be engendered, and a desire upon the part of Pennsylvania farmers to excel what they see others are doing, would lead to greater effort to secure the very best results attainable. Opportunities would be open to Pennsylvania farmers, such as they do not now possess, for introducing new blood into their herds and flocks, and for securing new varieties of fruits, vegetables and seeds. I can not take up space in this report to enlarge upon the benefits to be derived from such a fair, in which all the up-to-date farmers of the State would be equally interested, but I trust that the matter may be brought in proper form before the next Legislature, and that some measure may be passed that will secure the desired end.

Agricultural Journals: Under the head of Evidences of Progress, I have referred to the good work that is being done by Agricultural Journals, and I wish here to say but a word concerning their helpfulness to the farmer. Every professional and business man feels

the need of a Journal or paper devoted particularly to the interests of the calling in which he is engaged. A doctor, without a Medical Journal to keep him posted and in touch with the progress made by his profession, would soon lose professional standing, as well as interest in his work. The successful banker or merchant could not think of doing without the help derived from his business paper, and as farming is both a business and profession, farmers, as a class, need this help even more than others. The superior character of the leading agricultural papers published in our own State, and in other states, which have a circulation in Pennsylvania, together with the very reasonable price at which they may be secured, puts every Pennsylvania farmer within reach of help that he can not afford to do without.

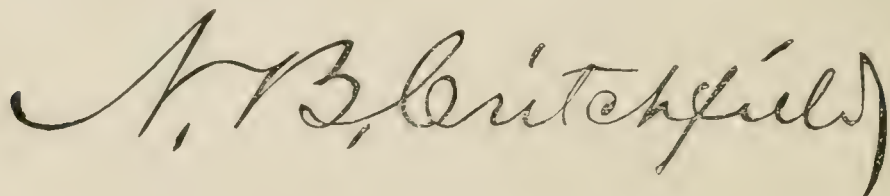
With the increased mail facilities enjoyed by people living in the country since the introduction of Rural Delivery, a daily newspaper is a valuable adjunct to the literature of the farm home, and it is a source of gratification, that the daily paper in the farmer's home is becoming the rule and not the exception. In addition to the satisfaction it affords the intelligent farmer to know what every day's doings are as time passes, the cost of his daily paper is paid many times during the year by his being able to read the daily market reports. I remember having once lost over \$10.00 in selling a bunch of cattle, simply because, through somebody's neglect, I missed getting my paper for two days in succession and did not know that prices had advanced 25 cents per hundred.

CONCLUSION.

In concluding this report, I wish to acknowledge my very high appreciation of the untiring devotion to duty manifested during the year by all the officers, as well as the entire clerical force of the Department. The Department is entirely free from "dead timber." Everybody connected with the Department has enough to do and does it well and willingly. I desire also to acknowledge the debt of gratitude I owe to your Excellency, for the substantial aid you have given the Department and the readiness with which you have embraced every opportunity for strengthening the hands of the Secretary, and increasing the helpfulness of the Department to the agriculture of the State.

The thanks of the Department are due also to the Public Press of the State for the willingness with which space has been given for the free publication of communications that have gone out from the Department, for the information of the people concerning changes made in laws relating to Department work, and other subjects of general interest to the public.

Very truly yours,

A handwritten signature in dark ink, reading "A. B. Britchfield". The script is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Secretary of Agriculture.

ELEVENTH ANNUAL REPORT OF THE DIVISION OF FARMERS' INSTITUTES FOR THE YEAR 1904-5.

HARRISBURG, PA., *January 1, 1906.*

To the Honorable N. B. Critchfield, *Secretary of Agriculture:*

Sir: I have the honor to present herewith the Eleventh Annual Report of the Division of Farmers' Institutes.

At no period in the history of agriculture has there been a more urgent demand for accurate information in all the varied lines of farm operations. We are brought face to face with a greater number of problems confronting agriculture in Pennsylvania than probably any other state in the Union, because of the multiplied and diversified crops produced within the State. This being true, in order to meet the increasing demand for information in so many directions, has led us to discriminate more closely in the selection of instructors, as the demand is for men and women of well-matured and practical experience on the farm and in the home, in the way of working out, by actual practice, the lessons and problems which are so important to be imparted to those of our farmers engaged in the same line of work. If the benefits derived from these institutes were to be judged by the attendance, we might refer to any one of the counties of the State in order to demonstrate the large attendance at these meetings. In Bradford, Bucks, Butler, Chester and Lancaster counties, the attendance in each, averaged above seven thousand. Many of these farmers drove a distance of fifteen miles in order to avail themselves of the lessons given at these meetings.

Whilst Pennsylvania is properly classed as the greatest manufacturing and mining state in the Union, yet the fact must not be overlooked that she stands in the front rank for the value and diversity of products grown upon her 224,000 farms. In order that our words may be more fully verified, we further on in this report give the acreage, production and value of a number of cereals, vegetables and live stock grown and produced on farms in the year 1904, by which Pennsylvania stands first in value and production of rye, second in value of potatoes, second in value of buckwheat; also second in value in the hay crop, which amounted to 53,000,000. In the value of dairy products, it stands second, exceeded only by New York, the dairy cows alone being valued at \$32,000,000. These figures are cited in order to bring to our minds not only the position Pennsylvania holds amongst the agricultural states, but the importance of developing within the farmer a more accurate knowledge of the soil he cultivates, as well as the most approved practice in the breeding and management of all the different kinds of animals raised on the farm, market gardening, the cultivation of small fruits, care and management of the orchard, how to control insect enemies and fungus diseases. The preparing for a profitable market of all these different products of the farm and garden demands instructors of no ordinary ability. The results accomplished within

the past ten years have been most encouraging. Dull, indeed, would be the perception of the person who fails to see the marked improvement and methods adopted in the care and management of the dairy cow in her carefully balanced ration, the sanitary milk and high grade butter; in poultry, of pure breeds, well housed and fed, producing eggs in the winter season when prices are high; manure so handled as to reduce the loss from leaching and evaporation to a minimum; orchards carefully cultivated, pruned and sprayed; farm machinery carefully housed, painted and oiled to prevent rust and loss.

Modern methods, in the main, adopted through the medium of farmers' institute instruction tend to make the farm not only more remunerative, but adds attractions to farm life of which our fathers and ourselves can scarcely comprehend, what, with rural telephones and delivery mails to our doors every day and trolley lines passing by our farm homes, carrying not only the farmer and his family, but also the products of the farm to the local market or railroad station. Farm life with these added attractions is appealing more than ever before to people who live in the cities and towns, thus drawing them to the farms. I can recall no time when so many people living in cities were making such active inquiry for farms to purchase as at present.

It has become an established practice in this Division to hold an annual meeting of county institute managers and State lecturers. These meetings are accomplishing a great work in crystalizing the instruction given at the general institutes held throughout the State. In May last, a meeting of this character was held at West Chester. A list of subjects presented, with the names of the lecturers, will give a more comprehensive knowledge of the scope of instruction given at the institute, which are as follows:

MEETING OF FARMERS' ANNUAL NORMAL INSTITUTE.

PROGRAM.

First session convenes Tuesday Evening, May 23, 1905.

DR. M. E. CONARD, Westgrove, Pa., Chairman.

Call to order 7.30.

Address of Welcome, by Chas. H. Pennypacker, Burgess, West Chester, Pa.

NOTE.—THE GOVERNOR HAS EXPRESSED A DESIRE TO BE PRESENT, IF POSSIBLE, AND IF HE WILL MAKE THE RESPONSE TO THE ADDRESS OF WELCOME.

1. "STATE CONSUMPTIVE CAMPS AND CURES." (40 minutes.)

Dr. J. T. Rothrock, West Chester, Pa.

2. "SPRAYING: HOW, WHEN AND WHAT FOR." (40 minutes, and 20 minutes for questions.)

Dr. J. H. Funk, Boyertown.

Wednesday Morning, May 24, 1905.

S. S. BLYHOLDER, Neale, Pa., Chairman.

Call to order 9.00.

1. "SOIL BACTERIA AND CULTURES—THEIR RELATION TO LEGUMINOUS PLANTS." (40 minutes, and 20 minutes for questions.)

Prof. T. R. Robinson, Bureau of Plant Industry, Department of Agriculture, Washington, D. C.

2. "THE PROPER THEORY OF FARM FERTILIZATION." (40 minutes, and 20 minutes for questions.)

Prof. Wells W. Cooke, Washington, D. C.

3. "THE CULTIVATION OF MUSHROOMS." (40 minutes, and 20 minutes for questions.)

Thomas Sharpless, West Chester, Pa.

Wednesday Afternoon, May 24, 1905.

REV. T. J. FERGUSON, Mechanicsburg, Pa., Chairman.

Call to order 1.30.

1. "THE ADVANTAGES OF CORN BREEDING TO THE PENNSYLVANIA FARMER." (Illustrated.) (40 minutes, and 20 minutes for questions.)

Prof. Franklin Menges, York, Pa.

Discussion opened by Henry Forsythe, West Chester, Pa.

2. "POULTRY BREEDING AND SPECIALTY BREEDING." (Samples of fowls used for demonstration.) (One hour, and 30 minutes for questions.)

T. E. Orr, Beaver, Pa.

Wednesday Evening, May 24, 1905.

J. MILTON LUTZ, Llanerch, Pa., Chairman.

Call to order 7.30.

1. "CONSOLIDATION OF RURAL SCHOOLS." (40 minutes.)

Mrs. Mary A. Wallace, Ellwood City, Pa.

2. "FARMERS' INSTITUTES—THEIR VALUE AND PLACE IN PUBLIC EDUCATION." (One hour.)

Prof. John Hamilton, Department of Agriculture, Washington, D. C.

3. "ADVANTAGES TO BE DERIVED FROM THE CENTRALIZED AND TOWNSHIP SCHOOLS." (60 minutes.)

Prof. Samuel B. Bayle, Superintendent of Erie County Public Schools, Fairview, Pa.

GENERAL DISCUSSION.

Thursday Morning, May 25, 1905.

WATSON T. DAVIS, Ivyland, Pa., Chairman.

Call to order 9.00.

1. "METHODS OF INSTITUTE WORK."

Prof. M. S. McDowell, State College, Pa.

Note.—Session devoted to discussion of questions relating to the local management of institutes, including the work and duties of the County Chairman and his responsibility, and what should be the leading topics for discussion at the coming institutes. Session is open for five-minute talks from County Chairmen, Institute Lecturers, and others interested.

Thursday Afternoon, May 25, 1905.

M. N. CLARK, Claridge, Pa., Chairman.

Call to order 1.30.

1. "DOUBLING CROPS IN MARKET GARDENING." (40 minutes, and 20 minutes for questions.)

Hon. R. F. Schwarz, Analomink.

2. "TILE DRAINING: WHY AND HOW." (40 minutes, and 20 minutes for questions.)

Dr. I. A. Thayer, New Castle, Pa.

3. "GROWING EARLY VEGETABLE PLANTS." (40 minutes, and 20 minutes for questions.)

Prof. R. L. Watts, Scalp Level, Pa.

Thursday Evening, May 25, 1905.

P. S. FENSTERMAKER, Allentown, Pa., Chairman.

Call to order 7.30.

1. "THE HORSE." (Illustrated.) (One hour.)

Dr. Leonard Pearson, State Veterinarian,
Harrisburg, Pa.

2. "BIRDS AND INSECTS." (Illustrated.) (One hour.)

Prof. H. A. Surface, Economic Zoologist,
Harrisburg, Pa.

Friday Morning, May 26, 1905.

P. S. FENSTERMAKER, Allentown, Pa., Chairman.

Call to order 9.00.

1. "CHALK TALK ON THE DAIRY COW." (Illustrated.) (45 minutes, and 30 minutes for questions.)

J. D. Detrich, West Chester, Pa.

2. "WHAT SHALL WE TEACH?" (40 minutes.)

J. H. Peachey, Belleville, Pa.

3. "SWINE—THE RELATION OF FOOD TO GROWTH." (40 minutes, and 20 minutes for questions.)

Prof. G. C. Watson, State College.

LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1904-5.

County.	Name and Address of Chairman.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No 16.
Bucks,	Watson T Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cambria,	H. J. Krumenacker, Nicktown.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Millhall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Elk,	John B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Fayette,	Sylvester Duff, Smock.
Forest,	C. A. Randall, Tionesta.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warriors' Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	W. L. McCracken, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Neshannock Falls.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.
Luzerne,	J. E. Hildebrandt, Dallas, R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	L. W. Howden, Coryville.
Mercer,	W. C. Black, Mercer.

County.

Millin,	M. M. Naginey, Milroy.
Monroe,	Randall Bisbing, East Stroudsburg.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	Edwin Lonsdale, Girard College, Phila. J. B. Kirkbride, Bustleton.
Pike,	B. F. Killam, Paupack.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 39.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	George A. Woodside, Sugargrove. R. J. Weld, Sugargrove.
Washington,	D. S. Taylor, Raccoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	J. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1904-5.

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
Bashore, Dr. Harvey B., West Fairview, Cumberland county.
Beardslee, R. L., Warrenham, Bradford county.
Black, W. C., Mercer, Mercer county.
Bond, M. S., Danville, Montour county.
Brodhead, C. W., Montrose, Susquehanna county.
Brubaker, A. L., Hogestown, Cumberland county.
Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
Butz, Prof. George C., State College, Centre county.
Campbell, J. T., Hartstown, Crawford county.
Clark, M. N., Claridge, Westmoreland county.
Conard, Dr. M. E., Westgrove, Chester county.
Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
Cox, John W., New Wilmington, Lawrence county.
Cure, Z. T., Jermyn, Lawrence county.
Detrich, Rev. J. D., West Chester, Chester county, R. F. D. No. 12.
Drake, W. M. C., Volant, Lawrence county.
Foight, John G., Export, Westmoreland county.
Funk, Dr. J. H., Boyertown, Berks county.
Hall, Horace H., Ellisburg, Potter county.
Hantz, Prof. J. M., Merrittstown, Fayette county.
Harlan, Hon. A. D., Wenonah, N. J.
Harshberger, J. W., Ph. D., Philadelphia.
Herr, Joel A., Millhall, R. F. D., Clinton county.
Hill, W. F., Chambersburg, Franklin county.
Hoover, Hon. E. S., Lancaster, Lancaster county.
Hull, Geo. E., Transfer, R. F. D., Mercer county.
Johnston, J. B., New Wilmington, Lawrence county.
Kahler, Hon. A. J., Hughesville, Lycoming county.
Ledy, J. H., Marion, Franklin county.
Lehman, Amos B., Fayetteville, Franklin county.
Lighty, L. W., East Berlin, Adams county.
McDonald, John T., Delhi, N. Y.
McDowell, Prof. M. S., State College, Centre county.
Menges, Prof. Franklin, York, York county.
Northrop, C. D., Elkland, Tioga county.
Northup, Henry W., Dalton, R. F. D., Lackawanna county.
Orr, T. E., Beaver, Beaver county.
Owens, Prof. Wm. G., Lewisburg, Union county.
Patton, James Y., New Castle, Lawrence county.
Peachey, J. H., Belleville, Mifflin county.
Phillips, Hon. Thomas J., Atglen, Chester county.
Schock, O. D., Hamburg, Berks county.
Schwarz, Hon. R. F., Analomink, Monroe county.
Seeds, R. S., Birmingham, Huntingdon county.

Stout, W. H., Pinegrove, Schuylkill county.
Stuart, R. R., Callensburg, Clarion county.
Surface, Prof. H. A., Economic Zoologist, Harrisburg.
Thayer, Dr. I. A., New Castle, Lawrence county.
Wagner, F. J., Harrison City, Westmoreland county.
Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.
Watts, Prof. R. L., Scalp Level, Cambria county.
Watts, D. H., Kerrmoor, Clearfield county.
Waychoff, G. B., Jefferson, Greene county.

The following is a complete and tabulated report of the location and number of institutes held in each county of the State; the number of sessions and attendance at each session; the number of speakers, both State and local who took part in discussions and instructions given:

PENNSYLVANIA FARMERS' INSTITUTES, SEASON OF 1904-1905.

County.	Place.	Date.	Days of Institute.	Number of sessions.	Attendance by sessions.			Speakers Present.		Attendance.		
								State.	Local.	Average.	Total.	By county.
ADAMS,	York Springs,	Nov. 30-31,	2	5	25	50	.....	3	.....	161	805	
	Bendersville,	Dec. 1,	1	3	275	105	350					
	Arendtsville,	Dec. 2-3,	2	5	30	300	.....	3	.....	137	410	
ALLEGHENY,	Carnegie,	Nov. 28-29,	2	5	280	83	260			139	694	1,909
	New Texas,	Nov. 30-Dec. 1,	2	5	178	58	.....	5	9	336	1,881	
	Sharon Church,	Dec. 2-3,	2	4	700	145	800					
ARMSTRONG,	Leechburg,	Jan. 20-21,	2	5	80	85	.....	5	1	152	760	
	Neale,	Jan. 30,	1	3	200	120	275					
	Elderton,	Jan. 31-Feb. 1,	2	5	55	105	.....	4	1	195	780	3,421
BEAVER,	Service,	Dec. 5-6,	2	5	400	220	.....	4				
	Fairview,	Dec. 7 8,	2	5	70	80	.....	4	3	56	280	
	North Sewickley,	Dec. 31,	1	2	41	85	130		2	85	256	
BEDFORD,	Mann's Choice,	Dec. 1-2,	2	5	110	150	.....	4	4	165	825	1,361
	Cessna,	Dec. 3,	1	2	425	225	450					
	Osterburg,	Dec. 5-6,	2	4	90	95	.....	3	.....	178	890	
BERKS,	Wernersville,	Jan. 20-21,	2	5	65	55	.....	3	4	135	675	
	Boyetown,	Jan. 30,	1	3	145	135	275		3	125	249	1,814
	Birdsboro,	Jan. 31,	1	3	92	170	.....	4	3			
BLAIR,	Geigertown,	Feb. 1,	1	3	100	100	250			106	530	
	Mohinsville,	Feb. 2,	1	3	130	75	105		3	75	150	
	Wessnerville,	Feb. 3,	1	3	50	105	65		1	69	275	955
	Tyrobe,	Dec. 27-28,	2	5	100	50	.....	3	4	163	816	
					141	150	375		2	235	705	
					150	275	285		3	260	780	
					170	225	285		3	150	450	
					100	100	250		3	155	475	
					75	150	250		3	145	435	3,621
					60	180	185		3			
					75	50	.....		2	80	400	
					50	100	125					

CENTRE,	Hubersburg,	Jan. 30-31,	2	5	{	100	{	50	{	2	3	150	750	1,575
						200									
						75									
CHESTER,	Phillipsburg,	Feb. 1-2,	2	5	{	100	{	75	{	2	3	185	825	1,575
						250									
						40									
	Avondale,	Jan. 13-14,	2	5	{	300	{	425	{	3	425	2,125	
						125									
						400									
	Byers,	Jan. 19-20,	2	5	{	400	{	240	{	3	204	1,320	
						200									
						275									
	Cedarville,	Feb. 3-4,	2	5	{	300	{	450	{	4	325	1,625	6,041
						81									
						277									
	Atglen,	Feb. 27-28,	2	5	{	260	{	340	{	4	7	317	1,550	
						220									
						130									
	Leeper,	Feb. 24-25,	2	5	{	110	{	169	{	4	12	200	1,000	
						166									
						300									
	Knox,	Feb. 27-28,	2	5	{	175	{	310	{	4	7	254	1,271	4,607
						315									
						160									
	West Freedom,	Mar. 3-4,	2	5	{	170	{	220	{	3	18	157	786	
						100									
						250									
	Troutville,	Jan. 13-14,	2	6	{	130	{	130	{	4	3	177	1,161	
						25									
						80									
	New Washington,	Jan. 16-17,	2	5	{	50	{	80	{	5	45	225	
						25									
						40									
	Utahville,	Jan. 17-18,	2	5	{	25	{	35	{	5	2	40	200	1,455
						50									
						75									
	Woolrich,	Jan. 18-19,	2	5	{	300	{	159	{	4	1	175	875	1,750
						75									
						100									
	Mackeyville,	Jan. 20-21,	2	5	{	250	{	200	{	4	2	175	875	
						33									
						125									
	Mainville,	Mar. 1-2,	2	6	{	85	{	150	{	4	1	141	843	
						55									
						200									
	Rohrsburg,	Mar. 3-4,	2	6	{	90	{	200	{	4	1	156	935	2,603
						150									
						300									
	Jerseytown,	Mar. 6,	1	3	{	77	{	180	{	4	4	163	815	
						100									
						165									
	Hartstown,	Dec. 29-30,	2	5	{	150	{	210	{	5	4	228	1,140	
						220									
						275									
	Seagerstown,	Jan. 2-3,	2	5	{	101	{	51	{	5	3	99	497	
						95									
						139									
	Cambridge Springs,	Jan. 4-5,	2	5	{	100	{	160	{	5	3	135	682	3,134
						225									
						350									
	Little Cooley,	Dec. 21,	2	5	{	82	{	165	{	5	3	207	622	
						97									
						225									
	Hogestown,	Dec. 22,	1	3	{	54	{	87	{	4	157	471	
						31									
						82									
	Churchtown,	Dec. 23,	1	3	{	31	{	82	{	4	88	263	992
						150									
						42									
	Jacksonville,	Dec. 24,	1	2	{	15	{	42	{	4	26	57	
						96									
						150									
	Dickinson Church,	Feb. 17-18,	2	5	{	210	{	200	{	3	8	211	1,056	2,469
						41									
						49									
	Middle Spring,	Jan. 2-3,	2	4	{	230	{	17	{	4	89	357	
						47									
						55									
	Linglestown,	Jan. 4-5,	2	5	{	200	{	108	{	4	127	635	992
						80									
						35									
	Berrysburg,	Jan. 11-12,	2	5	{	175	{	200	{	3	163	815	
						25									
						325									
	Concordville,				{	175	{	200	{	3	163	815	
						25									
						325									

PENNSYLVANIA FARMERS' INSTITUTES, SEASON OF 1904-1905—Continued.

County.	Place.	Date.	Days of institute.	Number of sessions.	Attendance by sessions.			Speakers Present.		Attendance.	
								State.	Local.	Average.	Total.
ELK,	Media,	Jan. 30-31,	2	5	112	53	.....	3	.....	127	635
	St. Marys,	Feb. 8-9,	2	5	200	50	220	3	4	133	667
	Weedville,	Feb. 10,	1	2	88	120	210	3	2	58	115
ERIE,	Waterford,	Dec. 7-8,	2	5	55	110	.....	4	4	200	1,000
	Erie,	Dec. 9-10,	2	5	30	300	280	4	5	206	1,030
	Wellsburg,	Dec. 19-20,	2	5	200	215	185	3	4	56	280
FAYETTE, (Special),	Edinboro,	Feb. 23-24,	2	5	50	45	.....	1	9	372	1,860
	Point Marion,	Feb. 23-24,	2	5	55	65	60	4	3	26	1,036
	Brownsville,	Feb. 25,	1	3	110	230	335	4	3	66	197
FOREST,	Vanderbilt,	Feb. 27-28,	2	5	80	320	.....	4	4	230	1,150
	Clarrington,	Feb. 17-18,	2	5	125	200	425	2	2	119	535
	Marienville,	Feb. 20,	1	2	100	130	150	2	2	93	185
FRANKLIN,	Orrstown,	Feb. 6-7,	2	5	35	150	.....	3	.....	307	1,535
	St. Thomas,	Feb. 7-8,	2	6	480	165	600	3	.....	129	779
	Fayetteville,	Feb. 8-9,	2	5	35	280	77	3	.....	202	1,010
FULTON,	Marion,	Feb. 10-11,	2	5	240	120	350	2	.....	150	750
	Buck Valley,	Nov. 28,	2	5	63	90	300	3	.....	50	250
	Emmaville,	Nov. 29-30,	2	5	35	50	60	3	.....	90	450
(Special),	McConnellsburg,	Mar. 15-16,	2	5	50	100	120	2	3	150	750
					150	200	180				1,450

GREENE,	Clarksville,	Feb. 15-16,	2	5	28	104	4	1	112	560	
	Whiteley,	Mar. 17-18,	2	5	50	234	4	2	179	896	1,456
	Mt. Union,	Dec. 7-8,	2	5	100	80	4	2	125	625	
	Warriors' Mark,	Dec. 9-10,	2	6	200	120	3	.....	130	780	1,405
	Gipsy,	Jan. 6-7,	2	5	100	200	5	4	140	700	
INDIANA,	Georgeville,	Jan. 9-10,	2	5	100	150	4	3	190	950	
	Shelocta,	Jan. 11-12,	2	5	250	200	4	3	260	1,300	2,950
	Grange,	Feb. 13-14,	2	5	350	200	2	5	128	640	
	Allen's Mills,	Feb. 14-15,	2	4	120	140	2	.....	76	395	
	Richardsville,	Feb. 15-16,	2	5	110	150	2	5	170	850	
JUNIATA,	Roseville,	Feb. 16-17,	2	4	750	220	2	.....	209	845	2,640
	Centre,	Feb. 28-Mar. 1,	2	5	160	285	4	2	183	915	
	Waterloo,	Mar. 3-4,	2	5	240	200	4	.....	161	805	1,720
	Clark's Summit,	Nov. 28,	1	3	80	120	3	.....	113	340	
	Bald Mount,	Nov. 29,	1	3	72	80	3	.....	93	278	
LANCASTER,	Fleetville,	Nov. 30,	1	3	70	78	3	.....	73	219	
	Tompkinsville,	Dec. 1,	1	3	72	78	3	.....	101	303	
	Daleville,	Dec. 2,	1	3	60	40	3	.....	83	250	
	Madisonville,	Dec. 3,	1	3	50	70	3	.....	87	260	1,650
	Rutland Park,	Sept. 6,	1	2	200	1,200	2	.....	700	1,400	
LAWRENCE,	Black Barren Springs,	Sept. 8,	2	3	175	1,100	2	.....	1,258	3,775	
	Cassel's Park,	Sept. 9,	1	1	175	.....	2	.....	175	175	
	Quarryville,	Feb. 15-16,	2	5	75	63	3	.....	208	1,038	
	Lampeter,	Feb. 17-18,	2	5	200	200	3	.....	270	1,350	
	Ephrata,	Feb. 24-25,	2	4	141	109	3	.....	205	811	8,149
LEBANON,	Ellwood City,	Dec. 9-10,	2	5	360	300	4	5	93	460	
	New Wilmington,	Dec. 19-20,	2	5	57	124	4	5	123	718	1,284
	Jonestown,	Feb. 13-14,	2	5	330	300	3	.....	99	495	
	Palmyra,	Mar. 1-2,	2	5	56	140	3	.....	58	288	783
	Macungie,	Feb. 13-14,	2	5	35	75	4	3	142	713	
LEHIGH,	Allentown,	Feb. 15-16,	2	5	100	168	0	1	153	765	
			2	5	150	200					

MONTGOMERY	King of Prussia,	Feb. 1-2,	125	110	3	3	169	845	4,840
	Washingtonville,	Feb. 13-14,	125	100	2	4	215	1,075	1,075
	Farmersville,	Feb. 6-7,	300	200	5	3	121	605	
	Tatamy,	Feb. 8-9,	60	100	2	3	119	598	
NORTHAMPTON	Akermanville,	Feb. 10-11,	48	25	5	3	161	805	2,008
	Elysbury,	Feb. 8-9,	185	140	5	4	213	1,065	
	Turbotville,	Dec. 27-28,	80	75	2	4	190	950	2,015
	Millerstown,	Dec. 29-30,	175	200	2	3	255	1,314	2,074
PERRY	Blain,	Jan. 18-19,	350	350	5	4	294	1,469	1,469
	Bustleton,	Dec. 4-5,	75	35	2	3	23	69	69
	Milford,	Nov. 28-29,	300	275	5	3	155	824	
	North Bingham,	Nov. 30-Dec. 1,	400	300	2	3	72	338	1,182
PHILADELPHIA	Roulette,	Feb. 24,	22	17	3	2	107	320	
	Andreas,	Feb. 24-25,	118	106	4	4	163	778	
	Orwigsburg,	Feb. 25-27,	200	80	2	4	155	620	
	Pinegrove,	Feb. 27-28,	75	40	5	4	175	875	2,593
SCHUYLKILL	Hegins,	Feb. 15-17,	50	100	2	3	97	485	
	Selinsgrove,	Feb. 18-19,	300	325	5	3	115	460	945
	Middleburg,	Dec. 19-20-21,	150	75	3	4	230	2,030	
	Somerset,	Dec. 22-23,	100	300	7	4	115	575	2,605
SNYDER	Barron's Church,	Jan. 20-21,	130	160	5	4	179	719	715
	Forksville,	Dec. 5-6,	13	39	2	3	38	189	
	Glenwood,	Dec. 7-8,	43	58	5	3	129	645	
	South Gibson,	Dec. 9-10,	35	60	2	3	68	272	1,106
SOMERSET	Montrose,	Dec. 27-28,	157	116	2	4	395	1,185	
	Westfield,	Dec. 29-30,	30	107	5	3	125	625	
	Wellsboro,	Jan. 2-3,	104	350	4	3	321	1,605	3,415
	Mansfield,	Jan. 2-3,	125	250	5	3			
SULLIVAN			75	90	5	3			
			175	350	5	3			
			100	190	5	3			
			100	190	5	3			
SUSQUEHANNA			100	190	5	3			
			100	190	5	3			
			100	190	5	3			
			100	190	5	3			
TIOGA			100	190	5	3			
			100	190	5	3			
			100	190	5	3			
			100	190	5	3			

PENNSYLVANIA FARMERS' INSTITUTES, SEASON OF 1904-1905—Continued.

County.	Place.	Date.	Days of Institute.	Number of sessions.	Attendance by sessions.			Speakers Present.	Attendance.			
					By counties.	Local.	State.		Average.	Total.	By counties.	
UNION,	Buffalo Roads,	Feb. 3-4,	5	65	60	4	142	710	1,780
	New Columbia,	Feb. 6-7,	.....	5	200	160	.....	3	.....	214	1,070
	Polk,	Jan. 9-10,	.....	5	350	80	.....	4	6	97	485
	Breedtown,	Jan. 11-12,	.....	5	35	70	.....	4	8	110	554
	Finleyville,	Feb. 8-9,	.....	5	52	125	.....	4	2	165	825
WASHINGTON,	Hickory,	Feb. 10-11,	4	80	180	4	181	725	2,444
	West Middletown,	Feb. 13-14,	.....	5	65	154	.....	4	2	179	894
	Newfoundland,	Dec. 19,	.....	3	100	175	.....	3	0	150	300
	Sterling,	Dec. 20,	.....	3	123	175	.....	3	0	122	367
	Hamilton,	Dec. 21,	.....	3	65	132	.....	3	0	66	197
WAYNE,	Ariel,	Dec. 22,	3	32	65	3	0	60	182	1,511
	South Canaan,	Dec. 23,	.....	3	75	100	.....	3	0	83	250
	Waymart,	Dec. 24,	.....	3	65	100	.....	2	0	72	215
	Scottdale,	Feb. 2,	.....	3	50	100	.....	2	0	138	275
	Pleasant Unity,	Feb. 3,	.....	1	145	130	.....	4	2	83	165
WESTMORELAND,	Greensburg,	Feb. 4,	2	60	105	4	1	53	106	982
	New Alexandria,	Feb. 6-7,	.....	2	38	70	.....	4	3	87	436
	Tunkhannock,	Jan. 16-17,	.....	5	70	130	.....	4	3	376	1,506
	West Nicholson,	Jan. 18-19,	.....	4	256	640	.....	4	4	237	940
	Corydon,	Dec. 2-3,	.....	4	140	330	.....	3	9	157	784
WARREN,	Youngsville,	Dec. 5-6,	5	240	260	4	2	143	713	1,497
	Hanover,	Dec. 5-6,	.....	5	60	260	.....	4	.....	54	318
				5	37	127	.....				
				5	110	120	.....				
				5	32	40	.....				

Stewartstown,	Dec. 7-8-9,	3	57	40	100	4	146	876
			229	200	250			
			33	35	.....		
Hellam,	Dec. 9-10,	2	200	26	.....	4	73	294
			50	50	.....		
Rossville,	Dec. 19-20,	2	400	82	500	4	217	1,085
								2,573
Total, .....	.....	862	.....	.....	.....	.....	.....	150,932

The following is the list of speakers who gave instruction at institutes, season of 1904-5, giving dates and places as well as list of topics discussed:

LIST OF SPEAKERS AND THEIR ASSIGNMENTS.

FOR THE SEASON OF 1904-1905.

S. F. BARBER, Box 104, Harrisburg, Dauphin County, Pa.

Town.	County.	Dates.
Schwenksville,	Montgomery,	Jan. 16-17.
Horticultural Hall,	Philadelphia,	Jan. 18.
Beyers,	Chester,	Jan. 19-20.

RICHARD D. BARCLAY, State College, Centre County, Pa.

Philipsburg,	Centre,	Feb. 2.
Buffalo Roads,	Union,	Feb. 3.

DR. HARVEY E. BASHORE, West Fairview, Cumberland County, Pa.

Rossville,	York,	Dec. 19-20.
Hogestown,	Cumberland,	Dec. 21.
Churchtown,	Cumberland,	Dec. 22.
Oakville,	Cumberland,	Dec. 23.
Dickinson Church,	Cumberland,	Dec. 24.

R. L. BEARDSLEE, Warrenham, Bradford County, Pa.

Harrison Valley,	Potter,	Nov. 28-29.
Roulette,	Potter,	Nov. 30-Dec. 1.
Corydon,	Warren,	Dec. 2-3.
Youngsville,	Warren,	Dec. 5-6.
Waterford,	Erie,	Dec. 7-8.
Erie,	Erie,	Dec. 9-10.
Hughesville,	Lycoming,	Jan. 30-31.
Halls,	Lycoming,	Feb. 1.
Warrensville,	Lycoming,	Feb. 2.
Newberry,	Lycoming,	Feb. 3.
Driftwood,	Cameron,	Feb. 4.

W. C. BLACK, Mercer, Mercer County, Pa.

Sunbury,	Butler,	Jan. 16-17.
Saxonburg,	Butler,	Jan. 18-19.
Leechburg,	Armstrong,	Jan. 20-21.

M. S. BOND, Danville, Montour County, Pa.

Town.	County.	Dates.
Salix,	Cambria,	Jan. 2-3.
Nicktown,	Cambria,	Jan. 4-5.
Gettysburg,	Indiana,	Jan. 6-7.
Lewistown,	Mifflin,	Feb. 23-24-25.
Centre,	Juniata,	Feb. 28 Mar. 1.
Waterloo,	Juniata,	March 2-3.

C. W. BRODHEAD, Montrose, Susquehanna County, Pa.

Georgeville,	Indiana,	Jan. 9-10.
Shelocta,	Indiana,	Jan. 11-12.
Troutville,	Clearfield,	Jan. 13-14.
Churchville,	Clarion,	Feb. 24-25.
Greenville,	Clarion,	Feb. 27-28.
Tylersburg,	Clarion,	March 1-2.
Edenburg,	Clarion,	March 3-4.

A. L. BRUBAKER, Hogestown, Cumberland County, Pa.

Hanover,	York,	Dec. 5-6.
Stewartstown,	York,	Dec. 7-8.
Hellam,	York,	Dec. 9-10.

J. S. BURNS, Imperial, R. F. D. No. 1, Allegheny County, Pa.

Will attend all meetings in Fifth Section from January 5, to March 1.

PROF. GEO. C. BUTZ, State College, Centre County, Pa.

Will attend all meetings in First Section from November 28, to January 7.

J. T. CAMPBELL, Hartstown, Crawford County, Pa.

Carnegie,	Allegheny,	Nov. 28-29.
New Texas,	Allegheny,	Nov. 30-Dec. 1.
Sharon Church,	Allegheny,	Dec. 2-3.
Sunbury,	Butler,	Jan. 16-17.
Saxonburg,	Butler,	Jan. 18-19.
Leechburg,	Armstrong,	Jan. 20-21.
West Alexandria,	Westmoreland,	Feb. 6-7.
Finleyville,	Washington,	Feb. 8-9.
Hickory,	Washington,	Feb. 10-11.

M. N. CLARK, Claridge, Westmoreland County, Pa.

Service,	Beaver,	Dec. 5-6.
Fairview,	Beaver,	Dec. 7-8.
Georgeville,	Indiana,	Jan. 9-10.
Shelocta,	Indiana,	Jan. 11-12.
Troutville,	Clearfield,	Jan. 13-14.

DR. M. E. CONARD, Westgrove, Chester County, Pa.

Town.	County.	Dates.
Sellersville,	Bucks,	Jan. 9-10.
Richlandtown,	Bucks,	Jan. 11-12.
Atglen,	Chester,	Feb. 27-28.

PROF. WELLS W. COOKE, Washington, D. C.

Will attend all meetings in First Section.

JOHN W. COX, New Wilmington, Lawrence County, Pa.

New Wilmington,	Lawrence,	Dec. 19-20.
Jamestown,	Mercer,	Dec. 27-28.
Hartstown,	Crawford,	Dec. 29-30.
North Sewickley,	Beaver,	Dec. 31.
Saegerstown,	Crawford,	Jan. 2-3.
Cambridge Springs,	Crawford,	Jan. 4-5.
Little Cooley,	Crawford,	Jan. 6-7.

Z. T. CURE, Jermyn, Lackawanna County, Pa.

Kresgeville,	Monroe,	Jan. 2-3.
Dallas,	Luzerne,	Jan. 4.
Pleasant Hill,	Luzerne,	Jan. 5.
Conyngham,	Luzerne,	Jan. 6-7.
Hublersburg,	Centre,	Jan. 30-31.
Philipsburg,	Centre,	Feb. 1-2.
Buffalo Roads,	Union,	Feb. 3-4.

REV. J. D. DETRICH, West Chester, R. F. D. No. 12, Chester County, Pa.

Richlandtown,	Bucks,	Jan. 11-12.
Langhorne,	Bucks,	Jan. 16-17.
Pineville,	Bucks,	Jan. 18-19.
Wernersville,	Berks,	Jan. 20-21.
King of Prussia,	Montgomery,	Feb. 2.
Farmersville,	Northampton,	Feb. 6-7.
Tatamy,	Northampton,	Feb. 8-9.
Ackermanville,	Northampton,	Feb. 10-11.

W. M. C. DRAKE, Volant, Lawrence County, Pa.

Polk,	Venango,	Jan. 9-10.
Breedtown,	Venango,	Jan. 11-12.
Slippery Rock,	Butler,	Jan. 13-14.

JOHN G. FOIGHT, Export, Westmoreland County, Pa.

Point Marion,	Fayette,	Feb. 23-24.
Vanderbilt,	Fayette,	Feb. 27-28.

DR. J. H. FUNK, Boyertown, Berks County, Pa.

Town.	County.	Dates.
York Springs,	Adams,	Nov. 29-30.
Bendersville,	Adams,	Dec. 1.
Arendtsville,	Adams,	Dec. 2-3.
Hanover,	York,	Dec. 5-6.
Stewartstown,	York,	Dec. 7-8.
Hellam,	York,	Dec. 9-10.
Centre Point,	Montgomery,	Jan. 9-10.
Concordville,	Delaware,	Jan. 11-12.
Avondale,	Chester,	Jan. 13-14.
Schwenksville,	Montgomery,	Jan. 16-17.
Horticultural Hall,	Philadelphia,	Jan. 18.
Beyers,	Chester,	Jan. 19-20.
Orrstown,	Franklin,	Feb. 6-7.
St. Thomas,	Franklin,	Feb. 8.
Fayetteville,	Franklin,	Feb. 9-10.
Marion,	Franklin,	Feb. 11.
Andreas,	Schuylkill,	Feb. 24.
Orwigsburg,	Schuylkill,	Feb. 25.
Pinegrove,	Schuylkill,	Feb. 27.
Hegins,	Schuylkill,	Feb. 28.

HORACE H. HALL, Ellisburg, Potter County, Pa.

Westfield,	Tioga,	Dec. 27-28.
Wellsboro,	Tioga,	Dec. 29-30.
New Washington,	Clearfield,	Jan. 16.
Utahville,	Clearfield,	Jan. 17.
Woolrich,	Clinton,	Jan. 18-19.
Mackeyville,	Clinton,	Jan. 20-21.

PROF. J. M. HANTZ, Merrittstown, Fayette County, Pa.

Saegerstown,	Crawford,	Jan. 2-3.
Cambridge Springs,	Crawford,	Jan. 4-5.
Little Cooley,	Crawford,	Jan. 6-7.

HON. A. D. HARLAN, Wenonah, N. J.

South Gibson,	Susquehanna,	Dec. 8.
Montrose,	Susquehanna,	Dec. 9.
Kresgeville,	Monroe,	Jan. 3.
Dallas,	Luzerne,	Jan. 4.
Boyertown,	Berks,	Jan. 30.
Birdsboro,	Berks,	Jan. 31.
Macungie,	Lehigh,	Feb. 13-14.
Allentown,	Lehigh,	Feb. 15-16.

J. W. HARSHBERGER, Ph. D., Philadelphia.

Geigerstown,	Berks,	Feb. 1.
Mohnsville,	Berks,	Feb. 2.
Wessnerville,	Berks,	Feb. 3.

JOEL A. HERR, Millhall, R. F. D., Clinton County, Pa.

Town.	County.	Dates.
Tyrone,	Blair,	Dec. 27-28.
Roaring Springs,	Blair,	Dec. 29-30.
West Middletown,	Washington,	Feb. 13-14.
Clarksville,	Greene,	Feb. 15-16.
Whiteley,	Greene,	Feb. 17-18.
Point Marion,	Fayette,	Feb. 23-24.
Vanderbilt,	Fayette,	Feb. 27-28.

W. F. HILL, Chambersburg, Franklin County, Pa.

Wellsburg,	Erie,	Dec. 19-20.
Smethport,	McKean,	Dec. 21-22.
Eldred,	McKean,	Dec. 23-24.
Salix,	Cambria,	Jan. 2-3.
Nicktown,	Cambria,	Jan. 4-5.
Gipsy,	Indiana,	Jan. 6-7.
Mainville,	Columbia,	March 1-2.
Rohrsburg,	Columbia,	March 3-4.
Jerseytown,	Columbia,	March 6.

HON. E. S. HOOVER, Lancaster, Lancaster County, Pa.

Mainville,	Columbia,	March 1-2.
Rohrsburg,	Columbia,	March 3-4.
Jerseytown,	Columbia,	March 6.

GEORGE E. HULL, Transfer, R. F. D., Mercer County, Pa.

Carnegie,	Allegheny,	Nov. 28-29.
New Texas,	Allegheny,	Nov. 30-Dec. 1.
Sharon Church,	Allegheny,	Dec. 2-3.
West Middletown,	Washington,	Feb. 13-14.
Clarksville,	Greene,	Feb. 15-16.
Whiteley,	Greene,	Feb. 17-18.

J. B. JOHNSTON, New Wilmington, Lawrence County, Pa.

New Washington,	Clearfield,	Jan. 16.
Utahville,	Clearfield,	Jan. 17.
Woolrich,	Clinton,	Jan. 18-19.
Mackeyville,	Clinton,	Jan. 20-21.

HON. A. J. KAHLER, Hughesville, Lycoming County, Pa.

Youngsville,	Warren,	Dec. 5-6.
Waterford,	Erie,	Dec. 7-8.
Erie,	Erie,	Dec. 9-10.
Emporium,	Cameron,	Feb. 6-7.
St. Mary's,	Elk,	Feb. 8-9.
Weedville,	Elk,	Feb. 10.

J. H. LEDY, Marion, Franklin County, Pa.

Town.	County.	Dates.
Media,	Delaware,	Jan. 30-31.
King of Prussia,	Montgomery,	Feb. 1-2.
Cedarville,	Chester,	Feb. 3-4.
Porterville,	Bradford,	Jan. 11-12.
Springhill,	Bradford,	Jan. 13-14.

AMOS B. LEHMAN, Fayetteville, Franklin County, Pa.

Millerstown,	Perry,	Dec. 27-28.
Blain,	Perry,	Dec. 29-30.
Linglestown,	Dauphin,	Jan. 2-3.
Berrysburg,	Dauphin,	Jan. 4-5.
Campbellstown,	Lebanon,	Jan. 6-7.
Washingtonville,	Montour,	Feb. 13-14.
Selinsgrove,	Snyder,	Feb. 15-16.
Middleburg,	Snyder,	Feb. 17-18.

L. W. LIGHTY, East Berlin, Adams County, Pa.

Will attend all meetings in Fourth Section.

JOHN T. McDONALD, Delhi, N. Y.

Clark's Summit,	Lackawanna,	Nov. 28.
Bald Mount,	Lackawanna,	Nov. 29.
Fleetville,	Lackawanna,	Nov. 30.
Tompkinsville,	Lackawanna,	Dec. 1.
Daleville,	Lackawanna,	Dec. 2.
Madisonville,	Lackawanna,	Dec. 3.
Glenwood,	Susquehanna,	Dec. 4-5.
South Gibson,	Susquehanna,	Dec. 7-8.
Montrose,	Susquehanna,	Dec. 9-10.

PROF. M. S. McDOWELL, State College, Centre County, Pa.

Will attend all meetings in First Section from January 9, to March 1.

PROF. FRANKLIN MENGES, York, York County, Pa.

Will attend all meetings in Third Section.

C. D. NORTROP, Elkland, Tioga County, Pa.

Rossville,	York,	Dec. 19-20.
Hogestown,	Cumberland,	Dec. 21.
Churchtown,	Cumberland,	Dec. 22.
Oakville,	Cumberland,	Dec. 23.
Dickinson Church,	Cumberland,	Dec. 24.
Millerstown,	Perry,	Dec. 27-28.
Blain,	Perry,	Dec. 29-30.

HENRY W. NORTHUP, Dalton, Lackawanna County, Pa.

Town.	County.	Dates.
New Columbia,	Union,	Feb. 6-7.
Turbotville,	Northumberland,	Feb. 8-9.
Elysburg,	Northumberland,	Feb. 10-11.
Weatherly,	Carbon,	Jan. 13.
New Mahoning,	Carbon,	Jan. 14.

T. E. ORR, Beaver, Beaver County, Pa.

Halls,	Lycoming,	Feb. 1.
Warrensville,	Lycoming,	Feb. 2.
Newberry,	Lycoming,	Feb. 3.
Driftwood,	Cameron,	Feb. 4.
Tylersburg,	Clarion,	March 1-2.
Edenburg,	Clarion,	March 3-4.

PROF. WM. G. OWENS, Lewisburg, Union County, Pa.

Tyrone,	Blair,	Dec. 27-28.
Roaring Springs,	Blair,	Dec. 29-30.

JAMES Y. PATTON, New Castle, Lawrence County, Pa.

Service,	Beaver,	Dec. 5-6.
Fairview,	Beaver,	Dec. 7-8.
Ellwood City,	Lawrence,	Dec. 9-10.
Jackson Centre,	Mercer,	Dec. 21-22.
New Vernon,	Mercer,	Dec. 23-24.
Neale,	Armstrong,	Jan. 30.
Elderton,	Armstrong,	Jan. 31-Feb. 1.
Scottdale,	Westmoreland,	Feb. 2.
Pleasant Unity,	Westmoreland,	Feb. 3.
Greensburg,	Westmoreland,	Feb. 4.

J. H. PEACHEY, Belleville, Mifflin County, Pa.

Buck Valley,	Fulton,	Nov. 28-29.
Emmaville,	Fulton,	Nov. 30.
Mann's Choice,	Bedford,	Dec. 1-2.
Cessna,	Bedford,	Dec. 3.
Osterburg,	Bedford,	Dec. 5-6.
Mt. Union,	Huntingdon,	Dec. 7-8.
Warriors' Mark,	Huntingdon,	Dec. 9-10.
New Foundland,	Wayne,	Dec. 19-20.
Ariel,	Wayne,	Dec. 21-22.
Waymart,	Wayne,	Dec. 23-24.
New Milford,	Pike,	Dec. 27-28.
Sciota,	Monroe,	Dec. 29-30.
Mansfield,	Tioga,	Jan. 2-3.
Windfall,	Bradford,	Jan. 4-5.
East Smithfield,	Bradford,	Jan. 6-7.
Litchfield Centre,	Bradford,	Jan. 9-10.
Porterville,	Bradford,	Jan. 11-12.
Springhill,	Bradford,	Jan. 13-14.

Town.	County.	Dates.
Tunkhannock,	Wyoming,	Jan. 16-17.
West Nicholson,	Wyoming,	Jan. 18-19.
Forksville,	Sullivan,	Jan. 20-21.
West Alexandria,	Westmoreland,	Feb. 6-7.
Finleyville,	Washington,	Feb. 8-9.
Hickory,	Washington,	Feb. 10-11.
Jonestown,	Lebanon,	Feb. 13-14.
Quarryville,	Lancaster,	Feb. 15-16.
Lampeter,	Lancaster,	Feb. 17-18.
Ephrata,	Lancaster,	Feb. 24-25.
Atglen,	Chester,	Feb. 27-28.

HON. T. J. PHILIPS, Atglen, Chester County, Pa.

Will attend all meetings in Second Section.

W. H. H. RIDDLE, Butler, Butler County, Pa.

Churchville,	Clarion,	Feb. 24-25.
Greenville,	Clarion,	Feb. 27-28.

OLIVER D. SCHOCK, Assistant to Dairy and Food Commissioner,
Harrisburg, Pa.

Glenwood,	Susquehanna,	Dec. 5-6.
Allentown,	Lehigh,	Feb. 15-16.
New Tripoli,	Lehigh,	Feb. 17-18.

HON. R. F. SCHWARZ, Analomink, Monroe County, Pa.

Will attend all meetings in Third Section.

ROBERT S. SEEDS, Birmingham, Huntingdon County, Pa.

Will attend all meetings in First Section.

HON. JASON SEXTON, North Wales, Montgomery County, Pa.

Mt. Union,	Huntingdon,	Dec. 7-8.
Lampeter,	Lancaster,	Feb. 17-18.

W. H. STOUT, Pinegrove, Schuylkill County, Pa.

Clark's Summit,	Lackawanna,	Nov. 28.
Bald Mount,	Lackawanna,	Nov. 29.
Fleetville,	Lackawanna,	Nov. 30.
Tompkinsville,	Lackawanna,	Dec. 1.
Daleville,	Lackawanna,	Dec. 2.
Madisonville,	Lackawanna,	Dec. 3.
New Tripoli,	Lehigh,	Feb. 17-18.

R. R. STUART, Callensburg, Clarion County, Pa.

Polk,	Venango,	Jan. 9-10.
Breedtown,	Venango,	Jan. 11-12.
Slippery Rock,	Butler,	Jan. 13-14.

DR. I. A. THAYER, New Castle, Lawrence County, Pa.

Will attend all meetings in Fourth Section.

F. J. WAGNER, Harrison City, Westmoreland County, Pa.

Town.	County.	Dates.
Somerset,	Somerset,	Dec. 19-20-21.
Barron's Church,	Somerset,	Dec. 22-23.

MRS. MARY A. WALLACE, Ellwood City, Lawrence County, Pa.

Ellwood City,	Lawrence,	Dec. 9-10.
Smethport,	McKean,	Dec. 21-22.
Eldred,	McKean,	Dec. 23-24.
Richardsville,	Jefferson,	Feb. 16.
Clarrington,	Forest,	Feb. 17-18.
Marienville,	Forest,	Feb. 20.

S. W. H. WALTZ, Williamsport, Pa.

Tunkhannock,	Wyoming,	Jan. 10-17.
West Nicholson,	Wyoming,	Jan. 18-19.
Forksville,	Sullivan,	Jan. 20-21.

PROF. R. L. WATTS, Scalp Level, Cambria County, Pa.

Will attend all meetings in Fifth Section.

D. H. WATTS, Kerrmoor, Clearfield County, Pa.

New Wilmington,	Lawrence,	Dec. 19-20.
Jackson Centre,	Mercer,	Dec. 21-22.
New Vernon,	Mercer,	Dec. 23-24.
Jamestown,	Mercer,	Dec. 27-28.
Hartstown,	Crawford,	Dec. 29-30.
North Sewickley,	Beaver,	Dec. 31.
Linglestown,	Dauphin,	Jan. 2-3.
Berrysburg,	Dauphin,	Jan. 4-5.
Campbelltown,	Lebanon,	Jan. 6-7.
Neale,	Armstrong,	Jan. 30.
Elderton,	Armstrong,	Jan. 31-Feb. 1
Scottdale,	Westmoreland,	Feb. 2.
Pleasant Unity,	Westmoreland,	Feb. 3.
Greensburg,	Westmoreland,	Feb. 4.
Grange,	Jefferson,	Feb. 13.
Allen's Mills,	Jefferson,	Feb. 14.
Roseville,	Jefferson,	Feb. 15.
Richardsville,	Jefferson,	Feb. 16.
Clarrington,	Forest,	Feb. 17-18.
Marienville,	Forest,	Feb. 20.

G. B. WAYCHOFF, Jefferson, Greene County, Pa.

Lewistown,	Mifflin,	Feb. 23-24-25.
Centre,	Juniata,	Feb. 28-March 1.
Waterloo,	Juniata,	March 2-3.

GENERAL LIST OF LECTURERS, SPEAKERS AND ESSAY-
ISTS, WITH THEIR SUBJECTS.

1904-1905.

BARBER, S. F., P. O. Box 104, Harrisburg, Dauphin County, Pa.:

1. The Silo Throughout the Year; Its Advantage.
2. Butter-Making on the Farm.
3. Care of the Stable, Manure and How Best to Apply It.
4. Feeding of Stock on the Farm.
5. Effect of Feed on the Quality of Milk.
6. The Effects of Thorough Cultivation.
7. Seeding of Grass for Hay.
8. Care of Milk for the Retail Trade.

BASHORE, DR. HARVEY B., West Fairview, Cumberland County
Pa.

1. Farm Hygiene. (15 minutes.)
2. Village Hygiene. (15 minutes.)
3. Good Health—A Much Neglected Crop. (15 minutes.)

BARCLAY, RICHARD D., State College, Centre Co.:

1. Bee-Keeping. (To suit occasion.)

BEARDSLEE, R. L., Warrenham, Bradford County, Pa.:

1. How to Renovate an Impoverished Farm.
2. How to Establish and Maintain a Dairy.
3. Fodder Corn, Silo and Silage.
4. Producing Grass and Making Hay.
5. Potato Culture.
6. The General Purpose Horse.

BLACK, W. C., Mercer, Mercer County, Pa.:

1. The Value of Pedigree.
2. The Beef Breeds of Cattle.
3. Comparison of Beef and Dairy Types for Beef Purposes.
4. Cultivation and Uses of the Corn Plant.
5. Sheep: The Breed, Mutton and Wool.
6. Care of the Flock.
7. Swine: The Breed for Profit.
8. Raising the Calf. (Each 30 minutes.)

BOND, M. S., Danville, Montour County, Pa.:

1. My Experience with Commercial Fertilizers for 25 Years. (30 minutes.)
2. History and Cultivation of Potatoes. (30 minutes.)

2. Raising and Marketing Vegetables. (25 minutes.)
4. Onions and Celery; Two Crops Same Year. (20 minutes.)
5. Thirty Minutes Chat with the Girls About Remaining on the Farm. (30 minutes.)
6. The Farmer, not the Financier, is King. (25 minutes.)

BRODHEAD, C. W., Montrose, Susquehanna County, Pa.:

1. Horseshoeing and Anatomy of Foot and Leg, with Specimens. (45 minutes.)
2. Care of Horses' Feet and Teeth, with Specimens. (40 minutes.)
3. Some Things Everyone should Know who Owns or Handles a Horse. (30 minutes.)
4. Zoology of the Horse; a Nature Study. (Illustrated with chart and specimens.) (30 minutes.)
5. Every Man should be Educated for Business.

BRUBAKER, A. L., Mechanicsburg, Cumberland County, Pa.:

1. Potato Culture.
2. The Farmers' Home.
3. The Farmers' Education.
4. The Farmers' Account Book.
5. Other Crops. (A plea to the farmers' boy or girl.) Each 30 minutes.)
6. Small Things on the Farm.
7. Hogs for Profit.

BURNS, J. S., Imperial, R. F. D. No. 1, Allegheny County, Pa.:

1. Breeding and Care of Swine. (30 minutes.)
2. Sheep Husbandry. (25 minutes.)
3. Training the Colt to Harness. (25 minutes.)
4. The Farmer's Need of Thoughtfulness. (35 minutes.)
5. The Farmer and His Wife. (30 minutes.)
6. Home Influence. (40 minutes.)
7. The Farmer's Accounts. (25 minutes.)
8. Growing and Preserving Pork for Family Use. (35 minutes.)
9. Corn Culture. (40 minutes.)
10. Education for Country Children. (35 minutes.)

BUTZ, PROF. GEO. C., State College, Centre County, Pa.:

1. Modern Treatment of Apple Orchards.
2. Peach Culture.
3. Insect Enemies of Farm and Garden.
4. Ornamentation of Home Grounds.
5. Botany of the Farm.
6. Agricultural Education.
7. Small Fruits.

CAMPBELL, J. T., Hartstown, Crawford County, Pa.:

1. Construction of Poultry Houses and Fixtures. (30 minutes.)
2. Profitable Egg Production. (45 minutes.)
3. Lice, Gapes and Poultry Diseases. (20 minutes.)

4. Gleanings from Experience with Incubators and Brooders. (25 minutes.)
5. Economic Methods of Maintaining the Productivity of the Soil. (40 minutes.)
6. Crop Rotation in Relation to Soil Improvement. (25 minutes.)
7. Commercial Potato Growing. (20 minutes.)
8. The Farmers' Garden. (20 minutes.)
9. Talk with, for and about Country Boys and Girls. (E. L.) (30-50 minutes.)

CLARK, M. N., Claridge, Westmoreland County, Pa.:

1. Is the County Agricultural Society a Help to the Farmer?
2. Buying and Care of Farm Implements.
3. Every Farmer Should be a Member of the Grange.
4. The Result of Eight Years Growing Swine.
5. Is the Farmers' Institute Producing Better Crops and Better Farmers?
6. The Farm Journal Should be Read by all the People.
7. Theory, and a Practical Education.
8. The Way I Grow Potatoes on Limestone Soil.
9. Fencing on the Farm. (15-30 minutes each.)
10. Marketing the Products of the Farm.

CONARD, DR. M. E., Westgrove, Chester County, Pa.:

1. An Inexpensive Up-to-Date Cow Stable.
2. How to Produce Pure and Wholesome Milk.
3. How Shall we Replenish Our Dairy Herds?
4. Some Neglected Points in the Feeding of Calves.
5. Conditions Necessary to Produce Good Milk.
6. Some Facts About the Feeding of Calves.

COOKE, PROF. WELLS W., 1328 Twelfth Street, N. W., Washington, D. C.:

1. Economical Feeding of Farm Stock.
2. The Value of Farm Manure and How to Retain It.
3. The Effect of Feed on the Quantity and Quality of Milk.
4. Theory and Practice of Crop Fertilization.
5. Feeding from the Silo Throughout the Year.
6. Forage Crops as a Substitute for Pasture.
7. Care and Feeding of Dairy Stock.
8. Handling Milk and Butter-Making.

COX, JOHN W., New Wilmington, Lawrence County, Pa.:

1. Easiest and Most Profitable Way to Grow Potatoes.
2. Raising and Care of Poultry.
3. Maintaining and Increasing.
4. Maintaining of Soil Moisture and Vegetable Matter in the Soil.
5. Commercial Fertilizers.
6. Education for the Farmer.

CURE, Z. T., Jermyn, Lackawanna County, Pa.:

1. Production and Care of Orchards. (20 minutes.)
2. Corn Culture. (20 minutes.)
3. The Economic Use of Commercial Fertilizers. (30 minutes.)
4. Potato Culture. (35 minutes.)
5. Education to the Farmer a Necessity. (35 minutes.)
6. The Handling of Sheep, and the Production of Early Spring Lambs. (20 minutes.)
7. The Raising and Early Training of Colts as an Adjunct to General Farming. (25 minutes.)
8. The Proper Handling of Heifer Calves up to and During First Year of Maternity. (20 minutes.)
9. A Talk on some of the Fundamental Principles upon Which Laws Governing Animal Improvement are Based. (25 minutes.)

DETRICH, REV. J. D., West Chester, R. F. D. No. 12, Chester County, Pa.:

1. How to Keep Twenty Head or More of Dairy Animals on Fifteen Acres.
2. Eighteen Years' Experience in Soiling.
3. Sixteen Years' Experience with Wooden Silo.
4. Shall we Grow Crops on a Fifteen-Acre Farm and no Fertilizer?
5. Feed, Breed and Care of the Dairy.
6. Breeding and Raising the Dairy Animal.
7. The Agricultural College and the Farmer.
8. The Farmer's Waste Basket.
9. The Small Farm vs. the Large Farm.
10. Bench, Book and Farm.

DRAKE, W. M. C., Volant, Lawrence County, Pa.:

1. The Value of Clover and How to Grow It. (20 minutes.)
2. Breeding, Feeding and Care of Farm Animals. (30 minutes.)
3. The Value and Application of Manure. (20 minutes.)
4. The Use of Commercial Fertilizers. (30 minutes.)
5. Farming for Profit.
6. Potato Culture.
7. The Value of Education to the Farmer. (20 minutes.)
8. Women's Rights.

FOIGHT, JOHN G., Export, Westmoreland County, Pa.:

1. Success in the Dairy. (40 minutes.)
2. Why Should Farmers Organize? (30 minutes.)
3. Small Fruits on the Farm. (20 minutes.)
4. Farm Literature. (20 minutes.)
5. The Farmers of To-day. (30 minutes.)
6. Our Homes. (30 minutes.)

FULLER, O. C., Turbotville, R. F. D. No. 1, Northumberland County, Pa.:

1. Bees on the Farm and Their Value as Fructifiers of Fruits, Grains and Grasses. (20 minutes.)

2. Bee-Keeping, Practical. (30 minutes.)
3. Bee-Keeping, Scientific. (20 minutes.)
4. Foul Brood; The Cause and Care. (20 minutes.)
5. The Education of Our Boys and Girls in the Rural Districts. (20 minutes.)

FUNK, DR. J. H., Boyertown, Berks County, Pa.:

1. Peach Culture. (45 minutes.)
2. The Commercial Orchard as a Business. (50 minutes.)
3. Pruning, Fertilizing and Thinning. (40-60 minutes.)
4. Spraying; When, How and What For. (40-60 minutes.)
5. Small Fruit Culture. (30 minutes.)
6. Potato Culture. (30-60 minutes.)
7. San José Scale. (40-60 minutes.)
8. The Birds and Insects as Friends and Foes. (45-60 minutes.)

GROFF, PROF. GEO. G., Lewisburg, Union County, Pa.:

1. Farm Hygiene. (1 hour.)
2. Dairy Hygiene. (1 hour.)
3. The Origin and Restoration of Soils. (1 hour.)
4. Weeds on Our Farms. (30 minutes.)
5. Modern Life Built on Chemistry. (30 minutes.)
6. The Teachers Needed in our Rural Schools. (30 minutes.)

HALL, HORACE H., Ellisburg, Union County, Pa.:

1. The Silo; Will it Pay? (30 minutes.)
2. Cement Stable Floors. (30 minutes.)
3. Permanent Pasture and Meadow. (20 minutes.)
4. Strawberries for Home and Market. (20 minutes.)
5. Dynamite; How to Handle It. (30 minutes.)
6. The Basis of our Greatness. (E. L.) (30 minutes.)
7. Our Greatest Benefactors. (E. L.) (25 minutes.)

HANTZ, PROF. J. M., Merrittstown, Fayette County, Pa.:

1. Potato Culture.
2. Money in Poultry.
3. The Dairy Cow.
4. Our Homes.
5. How to Build up a Run-Down Farm.
6. Dairying.
7. The True Idea of an Education. (E. L.) (60 minutes.)
8. The Growing of Strawberries, Raspberries and Blackberries.
9. Soil Moisture and Soil Culture.
10. How to Grow a Grass Crop.

HARLAN, HON. A. D., Wenonah, N. J.:

1. Alaska; Our Land of the Midnight Sun. (70-90 minutes.)
2. Hawaii and the Hawaiians; The Great Advantage the Islands are to Our Nation. (60-90 minutes.)
3. The Sproul Road Law; Importance of Good Roads.
4. Education the Greatest Factor in Agricultural Advancement.

**HARSHBERGER, PROF. JOHN W., University of Pennsylvania,
Philadelphia, Pa.:**

1. Accumulation of Soil Nitrogen. (45 minutes.)
2. The Role of Leguminous Plants in a Rotation. (45 minutes.)
3. Rusts of Agricultural Plants and How to Combat Them. (30 minutes.)
4. The Selection and Breeding of Indian Corn. (30 minutes.)
5. Problems Involved in the Supply of Pure Water to the Farm. (30 minutes.)
6. Some Neglected Plants; A Nature Study Talk. (45 minutes.)
7. Poisonous and Stock-Killing Plants. (30 minutes.)
8. Botany for the Country School. (45 minutes.)

HERR, JOEL A, Millhall, R. F. D., Clinton County, Pa.:

1. Selection and Care of Dairy Cows.
2. Specialties in Farming.
3. Large Fruit Culture.
4. Farm Fertility.
5. Practical Road-Making.
6. The Bright Side of Farm Life.
7. Concentrated Schools.
8. Education Through Organization.

HILL, W. F., Chambersburg, Franklin County, Pa.:

1. Organization; The Present Power. (30 minutes.)
2. Soil Conditions for Good Crops. (20 minutes.)
3. Saving and Applying Manure. (20 minutes.)
4. Potato Culture. (20 minutes.)
5. Our Education, our Capital. (20 minutes.)
6. Neighborhood Improvement. (20 minutes.)

HOOVER, HON. E. S., Lancaster, Lancaster County, Pa.:

1. Forestry as Pertaining to Farming. (20 minutes.)
2. Education of Farmers' Sons. (15 minutes.)
3. Incentives to Farming. (15 minutes.)
4. Failures in Farming and the Causes. (15 minutes.)
5. System on the Farm. (15 minutes.)
6. Beautifying Home Grounds. (15 minutes.)
7. Soil Improvement. (15 minutes.)
8. Cultivation of Tobacco Plant; Its Curing and Preparing for Market. (20 minutes.)
9. The Proper Time for Harvesting Farm Crops. (15 minutes.)
10. Proper Use and Care of Farm Machinery. (15 minutes.)
11. The Horse; His Breeding, Rearing and Training. (20 minutes.)
12. Growing Trees on the Farm. (15 minutes.)
13. Farmers' Institutes; Their Importance and Benefit. (15 minutes.)

HULL, GEO. E., Transfer, R. F. D., Mercer County, Pa.:

1. Making Marketable Farm Butter.
2. Construction and Filling of Silos.

3. Construction of a Labor-Saving Dairy Barn.
4. Marketing Farm Products.
5. The Farm Water Supply.
6. Feeding Steers for Market.
7. Some Lessons from Keeping Sheep.
8. Our Farm Homes.

JOHNSTON, J. B., New Wilmington, Lawrence County, Pa.:

1. Small Fruits on the Farm. (15 minutes.)
2. Care of the Orchard from Infancy to Maturity. (20 minutes.)
3. Why, When and How to Spray. (15 minutes.)
4. Picking, Packing and Storing Apples. (20 minutes.)

KAHLER, HON. A. J., Hughesville, Lycoming County, Pa.:

1. Soil Fertility.
2. Corn Culture.
3. Taxation, and How it Affects the Farmer.
4. Hogs for Profit.
5. Concentration of Schools in Rural Districts.
6. My Experience with Lime and Commercial Fertilizer.
7. Proper Care of Barnyard and Manure.
8. How Best to Keep the Boys on the Farm.

LEDY, J. H., Marion, Franklin County, Pa.:

1. General Fruit Growing; How to Take Care of Trees.
2. Peach, Apple and Plum Culture.
3. Pruning, Cultivating and Fertilizing the Orchard.
4. The Farmers' Garden.
5. Alfalfa; Its Value and How to Grow It.
6. Small Fruit Culture.
7. Tomatoes and Cantaloupes; How to Grow Them.
8. Poultry and Profit, and How to Make Hens Lay.
9. Roads and Road Taxes.
10. Crimson Clover and Soja Beans; Their Value and How to Grow Them.

LEHMAN, AMOS B., Fayetteville, Franklin County, Pa.:

1. Breeding, Feeding and Profit in Hogs.
2. Legumes for Feed and Fertility.
3. Comparison of Profits; Dairy vs. Beef Cattle.
4. Our Insect Friends and Foes.
5. Nature Study in the Public Schools.
6. Questions and Replies.
7. Theory and Practice in Farming.

LIGHTY, L. W., East Berlin, Adams County, Pa.:

1. The Farmers' Cow; How to Make Her Profitable. (30-40 minutes.)
2. Feeding the Dairy Cow. (30-40 minutes.)
3. Producing and Marketing Dairy Products. (30-40 minutes.)
4. Silo Experience and Practice. (30-40 minutes.)

5. Soiling and Soiling Crops. (30-40 minutes.)
6. Culture and Feeding of the Corn Crop. (30-40 minutes.)
7. Value, Care and Application of Farm Manure. (30-40 minutes.)
8. The Making of a Home on the Farm. (30-40 minutes.)
9. Education for Our Boys and Girls; What and How. (30-40 minutes.)
10. Sunshine. (A short talk, especially for Farmers' Boys and Girls.) (15 minutes.)

McDONALD, JOHN T., Delhi, N. Y.:

1. How I Have Made Dairy Farming a Success. (20 minutes.)
2. How I Make Poultry Pay with the Dairy Farm. (20 minutes.)
3. How I Make the Finest of Butter and Sell it at a Paying Price. (20 minutes.)
4. Value of Skim Milk Fed Back to the Dairy.

McDOWELL, PROF. M. S., State College, Centre County, Pa.:

1. Commercial Fertilizers.
2. Lime and its Action.
3. Soil Moisture.
4. Barnyard Manure.
5. Why Educate?

MENGES, PROF. FRANKLIN, York, York County, Pa.:

1. The Advantages of a Knowledge of Chemistry to the Farmer.
2. Fixation of Free Nitrogen Explained.
3. Nitrification; Conditions Necessary to Produce It.
4. The Maintenance of Soil Moisture.
5. Methods for the Cultivation of Hay and Leguminous Crops.
6. The Functions of the Various Foods Necessary to Plant Growth.
7. The Feeding Powers and Habits of Some Agricultural Plants.
8. The Necessity of Education for the Farmer Compared with Other Vocations.
9. Value of Our Native Birds to the Farmer.
10. Insect Friends and Foes of the Farmer. (20-30 each.)

NORTHROP, C. D., Elkland, Tioga County, Pa.:

1. Feeding and Care of the Dairy Cow.
2. Making and Marketing Gilt-Edged Butter.
3. How to Use the Babcock Test in the Dairy. (Illustrated.)
4. Corn Crop and Silo.
5. Potatoes and How to Grow Them.
6. Farm Fertility; Experience with Run-Down Farms.
7. Education for Farmers and Their Children.
8. Making a Home in the Country.
9. The Wife, a Partner.
10. Broad Tires and Good Roads.
11. Farmers' Mutual Telephone Line.

NORTHUP, HENRY W., Dalton, Lackawanna County, Pa.:

1. Selection, Care and Management of the Dairy. (30 minutes.)
2. Practical Experience with the Silo. (30 minutes.)
3. Potato Growing. (20 minutes.)
4. The Exhaustion and Restoration of Our Soil. (30 minutes.)
5. Fruit Culture. (20 minutes.)
6. Farm Products and How to Market Them. (20 minutes.)
7. Nature Study for Country Schools. (20 minutes.)
8. Educating the Farmer and Increasing his Usefulness. (20 minutes.)
9. Desirable Country Homes and How to Enjoy Them. (20 minutes.)

ORR, T. E., Beaver, Beaver County, Pa.:

1. Poultry on the Farm. (20-60 minutes.)
2. Poultry; The Breed or the Feed. (20-40 minutes.)
3. Poultry Houses and Yards. (20-40 minutes.)
4. The Five G's of Poultry Keeping. (30-60 minutes.)
5. Incubators and Brooders. (20-40 minutes.)
6. Your Youth and Mine on the Farm. (30-50 minutes.)
7. The Smallest but Most Useful Implement. (20-40 minutes.)
8. The Farmer as a Business Man. (20-40 minutes.)
9. The Farmer and the Public Schools. (30-50 minutes.)
10. Public Roads in Pennsylvania. (20-40 minutes.)

OWENS, PROF. WM. G., Lewisburg, Union County, Pa.:

1. Chemistry on the Farm. (Evening.) (60 minutes.)
2. Weeds. (20 minutes.)
3. Sanitation in the Dairy. (30 minutes.)
4. Improvement by Breeding. (30 minutes.)
5. The Water on the Farm. (30 minutes.)
6. Formation and Improvement of Soils. (30 minutes.)
7. Education on the Farm. (Evening.) (60 minutes.)
8. Use of Manure. (30 minutes.)

PATTON, JAMES Y., New Castle, Lawrence County, Pa.:

1. Breeding and Feeding Poultry. (30 minutes.)
2. Winter Eggs. (30 minutes.)
3. How I Made Dairying Profitable. (20 minutes.)
4. How I Grow Good Clover. (20 minutes.)
5. When, and How to Apply Manure, and Why. (15 minutes.)
6. Preserving Soil Moisture. (15 minutes.)

PEACHEY, J. H., Belleville, Mifflin County, Pa.:

1. The Farmer's Boy; His Education.
2. Half-Hour in the Corn Field.
3. Hogs for Profit.
4. Soil Improvement.
5. Echoes from the Farm.

6. Nature Study in the Public Schools.
7. Care of Farm Animals.
8. The Inside of the Farmer's Home.
9. Success with Clover. (25-30 minutes each.)

PHILIPS, HON. THOMAS J., Atglen, Chester County, Pa.:

1. Renewed Fertility; How to Get It. (25 minutes.)
2. Profit or Loss in the Dairy. (25 minutes.)
3. Commercial Fertilizers; Their Nature and Use. (30 minutes.)
4. Lime; Do You Need Some? (20 minutes.)
5. The Farmers' Garden. (20 minutes.)
6. The Chicken; a Source of Profit. (20 minutes.)
7. The Wife's Share. (Evening Lecture.) (45 minutes.)
8. The Farmer Should be a Business Man. (E. L.) (40 minutes.)

RIDDLE, W. H. H., Butler, Butler County, Pa.:

1. The Practical Farmer.
2. Good Local Government.
3. Making Farmers' Homes Attractive.
4. Amateur Grape Culture.
5. The Family Garden.
6. Floriculture in the Country.
7. Hints on Poultry for the Farmer.

SCHOCK, OLIVER D., Assistant to Dairy and Food Commissioner,
Harrisburg, Pa.:

1. Enforcing the Pure Food Laws of Pennsylvania.
2. Education for the Farmers' Sons and Daughters.
3. Floriculture in Country Homes.
4. Progress in Agriculture.
5. Profitable Poultry on the Farm.
6. Growing Grapes for Pleasure and Profit.
7. The County Fair.

SCHWARZ, HON. R. F., Analomink, Monroe County, Pa.:

1. Market Gardening. (45 minutes.)
2. Small Fruit Gardening. (25 minutes.)
3. Fruit and Vegetables for the Farmer's Table. (E. L.) (40 minutes.)
4. The Commercial Orchard. (25 minutes.)
5. A Thorough Understanding of the Fertilizer Question. (40 minutes.)
6. Success with Crimson Clover and Vetches, or the Reclaiming of Worn-out Soil Without Manure. (50 minutes.)
7. Does Poultry Pay? (30 minutes.)
8. Good Tools and How to Use and Care for Them. (25 minutes.)
9. The New Road Law and the Farmer's Duty Under It. (25 minutes.)
10. Why the Modern Successful Farmer Needs Education, and What it Should Be. (60-70 minutes.)

SEEDS, R. S., Birmingham, Huntingdon County, Pa.:

1. Value of Fertility and Cheapest Way to Get It. (30-40 minutes.)
2. What Constitutes a Country Home. (30-40 minutes.)
3. Education and the Farmer. (30 minutes.)
4. Benefits Derived from Farmers' Institutes. (20 minutes.)
5. What I Know About Roads. (20 minutes.)
6. Soil Improvement, the Keystone of Agriculture. (30 minutes.)
7. Mistakes of Life Exposed. (E. L.) (60 minutes.)

SEXTON, HON. JASON, North Wales, Montgomery County, Pa.:

1. Our Wasted Resources. (30 minutes.)
2. How to Make the Dairy a Success. (30 minutes.)
3. How to Make the Farm Pay. (30 minutes.)
4. What the Farmer's Home and Surroundings Should Be. (30 minutes.)

STOUT, W. H., Pinegrove, Schuylkill County, Pa.:

1. Fruit Growing.
2. Experience in Draining Clay Bottom Land.
3. Theory vs. Practice.
4. Commercial Fertilizers and Compounds.
5. Wasting Manure.
6. Geological Observations. (30 minutes each.)

STUART, R. R., Callensburg, Clarion County, Pa.:

1. Raising Swine for Profit. (30-40 minutes.)
2. Dairy Bacteriology. (30 minutes.)
3. Sheep Husbandry. (40 minutes.)
4. Shall We Educate the Farm Boy? (30 minutes.)
5. Centralization of Township Schools. (40 minutes.)
6. The Home and the School. (30 minutes.)
7. The Advantages of a Scientific Education to the Farmer. (30 minutes.)
8. Fruit Culture for the Home and for Market. (50-60 minutes.)
9. Stable Manure. (40 minutes.)
10. Life—What Is It? (E. L.) (60 minutes.)
11. The Farmer's Wife and Family. (45 minutes.)

SURFACE, PROF. H. A., Economic Zoologist, Harrisburg, Pa.:

1. The Economic Value and Protection of Our Native Birds. (40-50 minutes.)
2. General Principles and Methods of Insect Warfare. (40 minutes.)
3. The Hessian Fly in Pennsylvania. (30 minutes.)
4. Our Insect Friends. (Illustrated.) (30-40 minutes.)
5. Nature Study and Agriculture in the Public Schools. (25-30 minutes.)
6. The Centralization of Schools. (20 minutes.)

7. Higher Education for Farmers' Boys and Girls. (20-25 minutes.)
8. The Elements of Success. (15-20 minutes.)
9. The Needs of the Farmer. (30-40 minutes.)

THAYER, DR. I. A., New Castle, Lawrence County, Pa.:

1. Tile Draining; Why and How. (40 minutes.)
2. Soil Moisture. (30 minutes.)
4. Stable Manure. (40 minutes.)
5. Commercial Fertilizers. (30 minutes.)
6. The Clovers as Food, and How to Cure. (30 minutes.)
7. The Clovers as Fertilizers. (40 minutes.)
8. The Principles of Stock Feeding. (30 minutes.)
9. Strawberry Culture. (30 minutes.)
10. Importance of Nature Studies in the Public Schools. (20 minutes.)
11. Plant Life; A Nature Study. (20 minutes.)
12. Our Animal Friends; A Nature Study. (20 minutes.)
13. Home Hygiene. (30 minutes.)

WAGNER, F. J., Harrison City, Westmoreland County, Pa.:

1. Soils and Soil-Making. (15-20 minutes.)
2. The Business Side of Farming. (15-20 minutes.)
3. Profitable Dairying. (15-20 minutes.)
4. Clover and Its Place on the Farm. (15-20 minutes.)
5. What Shall We Read? (E. L.) (20 minutes.)
6. Advantages of the Cream Separator. (15 minutes.)

WALLACE, MRS. MARY A. ("Aunt Patience"), Ellwood City, Lawrence County Pa.:

1. Domestic Science. (E. L.) (40 minutes.)
2. A Talk with Country Boys and Girls. (E. L.) (40 minutes.)
3. The Centralization of Public Schools. (30 minutes.)
4. Food and Nutrition of Man. (40 minutes.)
5. The Country Home; Its Sanitation, Etc. (25 minutes.)

WATTS, PROF. R. L., Scalp Level, Cambria County, Pa.:

1. How Plants Feed and Grow. (30 minutes.)
2. Conservation of Soil Moisture. (30 minutes.)
3. Care and Management of Orchards. (30 minutes.)
4. Apples in Pennsylvania. (30 minutes.)
5. The Cultivation of Small Fruits. (30 minutes.)
6. Market Gardening. (30 minutes.)
7. Nature Study in Public Schools. (30 minutes.)
8. Beautifying the Home Grounds. (30 minutes.)
9. Opportunities and Advantages for Young Men on the Farm. (30 minutes.)

WATTS, D. H., Kerrmoor, Clearfield County, Pa.:

1. The Dairy Herd and Stable. (30 minutes.)
2. Feed and Care of the Dairy Herd. (30 minutes.)

3. The Silo and Why Profitable. (30 minutes.)
4. Gilt-edge Butter; How to Make It and Sell It. (30 minutes.)
5. The Steam Engine and Its Use on our Farm. (20 minutes.)
6. Farm Buildings and Their Location. (30 minutes.)
7. The Apple Orchard and Its Care. (30 minutes.)
8. Gathering and Marketing Fruits. (30 minutes.)
9. A Practical Education for the Farmer. (30 minutes.)

WAYCHOFF, G. B., Jefferson, Greene County, Pa.:

1. Lime and Liming. (20 minutes.)
2. Raising Clover. (20 minutes.)
3. Clover as a Fertilizer. (20 minutes.)
4. Feeding Value of Clover. (20 minutes.)
5. Theory and Practice of Drainage. (25 minutes.)
6. Small Fruits for the Home. (25 minutes.)
7. A Never-ending Feast. (25 minutes.)
8. My Ideal in Education. (Evening.) (25 minutes.)
9. Life's Opportunities. (Evening.) (25 minutes.)
10. Modern Corn Culture. (25 minutes.)

CROP REPORT.

The past year so far as the prices of farm products is concerned may be reported as quite satisfactory. The price of farm labor is constantly advancing, as in many localities, the procuring of suitable farm help at a reasonable scale of wages has become a difficult problem.

CROP REPORT FOR 1905.

Giving Prices of Farm Products and Live Stock, with Farm Wages and Board, in Pennsylvania, by Counties. Collected by
A. L. Martin, Deputy Secretary of Agriculture.

Counties.	Cereals.				Hay.		Live Stock.									
	Wheat.	Corn.	Oats.	Rye.	Buckwheat.	Hay, clover.	Hay, timothy.	Horses, average.	Mules, average.	Cows, average.	Lambs, average.	Ewes, average.	Steers, fat, per pound.	Steers for feeding, per pound.	Swine, shoats, per pound.	Fat hogs, per pound.
Adams,	\$0 85	\$0 50	\$0 30	\$0 55	\$0 53	\$8 00	\$10 00	\$125 00	\$140 00	\$35 00	\$3 75	\$3 50	\$0 04	\$0 03	\$0 05	\$0 06
Allegheny,	75	55	35	65	70	10 00	12 00	150 00	110 00	40 00	3 00	3 50	05	04	05	06
Armstrong,	85	55	35	70	60	9 00	11 00	130 00	120 00	35 00	5 00	4 00	04	03	05	04
Beaver,	85	55	35	65	.....	10 00	13 00	125 00	125 00	35 00	2 50	3 00	05	04	05	06
Bedford,	90	55	35	65	55	8 00	10 00	115 00	125 00	35 00	3 50	4 50	04	03	06	07
Berks,	90	65	40	60	55	12 00	15 00	125 00	125 00	35 00	4 50	5 50	05	04	07	07
Blair,	80	50	35	70	50	12 00	15 00	125 00	130 00	35 00	4 00	4 00	05	04	06	06
Bradford,	90	65	40	60	55	7 00	9 00	125 00	125 00	28 00	4 00	4 50	05	04	04	05
Bucks,	85	60	40	65	65	10 00	13 50	150 00	140 00	40 00	5 00	4 50	05	04	08	08
Cambria,	1 00	60	40	68	50	10 00	12 00	115 00	110 00	25 00	4 00	3 00	04	03	05	06
Butler,	85	55	45	65	60	12 00	15 00	135 00	120 00	35 00	4 00	4 00	05	04	06	07
Cameron,	90	70	45	70	55	12 00	16 00	100 00	.....	35 00	3 50	3 00	05	04	05	06
Carbon,	85	50	32	60	50	8 50	10 50	150 00	175 00	40 00	.....	.....	06	04	06	06
Centre,	85	60	40	77	75	9 50	12 00	150 00	175 00	40 00	4 00	5 00	05	04	05	07
Chester,	75	60	35	65	65	9 50	10 50	125 00	.....	32 50	3 50	4 00	04	03	05	06
Clarion,	85	30	35	70	50	11 00	14 00	125 00	90 00	35 00	3 00	4 00	06	04	06	07
Clearfield,	90	35	40	70	50	8 50	10 50	105 00	.....	30 00	4 50	5 00	04	03	05	06
Clinton,	80	50	35	60	55	10 00	13 00	150 00	175 00	35 00	4 00	3 50	05	04	05	07
Columbia,	90	60	35	65	55	10 00	13 00	150 00	.....	35 00	4 00	4 50	04	03	04	05
Crawford,	92	55	35	60	54	8 50	7 00	110 00	.....	25 00	4 00	4 50	05	04	06	06
Cumberland,	80	50	35	50	50	9 00	12 00	125 00	130 00	35 00	4 00	5 00	05	04	06	07
Dauphin,	95	55	35	57	55	11 00	12 50	140 00	140 00	36 50	5 00	4 50	05	04	06	07
Delaware,	80	60	45	70	.....	13 00	15 00	110 00	125 00	35 00	5 00	6 00	05	04	07	07

Elk,	95	65	40	70	70	.....	14 00	150 00	.....	40 00	3 50	5 00	06	04	07	08
Erie,	83	55	35	60	60	8 00	10 00	140 00	135 00	35 00	3 75	4 25	05	04	05	06
Fayette,	1 00	60	37	75	75	11 00	13 50	150 00	160 00	40 00	4 50	4 50	05	01	05	07
Forest,	95	55	40	75	75	7 00	11 00	140 00	.....	30 00	3 00	3 00	05	04	05	06
Franklin,	82	50	35	55	55	7 50	9 50	130 00	140 00	32 50	3 50	5 00	05	04	05	06
Fulton,	90	60	38	78	80	8 00	10 00	130 00	115 00	38 00	3 75	4 50	04	03	05	06
Greene,	85	50	35	70	70	9 00	11 00	130 00	125 00	38 00	2 50	3 50	04	03	05	06
Huntingdon,	85	50	35	60	60	10 00	12 00	125 00	150 00	30 00	4 00	4 00	04	03	06	06
Indiana,	85	55	35	65	65	7 00	9 00	125 00	130 00	35 00	4 25	4 75	01	03	05	06
Jefferson,	90	45	40	65	60	8 00	12 00	130 00	175 00	35 00	4 00	4 50	05	04	05	06
Junata,	90	55	35	60	60	10 00	10 50	140 00	150 00	35 00	4 50	4 50	05	04	05	06
Lackawanna,	80	65	40	70	70	12 00	14 00	130 00	140 00	35 00	3 50	4 00	05	04	05	06
Lancaster,	80	55	35	60	60	12 00	14 00	130 00	130 00	35 00	4 00	4 00	05	04	05	06
Lawrence,	85	40	35	65	65	10 00	12 00	110 00	90 00	35 00	3 50	4 00	01	03	05	06
Lebanon,	80	55	35	55	55	11 00	14 00	120 00	130 00	40 00	4 00	3 25	05	04	06	06
Lehigh,	90	55	35	65	65	12 00	15 00	160 00	150 00	40 00	4 00	3 25	05	04	06	07
Luzerne,	94	60	40	65	65	55	12 00	16 00	140 00	35 00	4 50	4 00	05	04	06	07
Lycoming,	85	50	40	65	65	12 00	14 00	125 00	140 00	35 00	4 50	4 00	05	04	06	06
McKean,	95	65	40	65	60	8 00	10 00	125 00	.....	35 00	3 00	2 50	04	03	06	07
Mercer,	85	60	35	60	65	8 00	10 00	125 00	140 00	32 00	4 00	4 00	05	04	05	06
Mifflin,	85	50	30	55	55	9 00	11 00	120 00	115 00	32 00	3 75	4 00	05	04	05	06
Monroe,	90	65	35	50	50	10 50	14 00	130 00	140 00	30 00	4 00	3 50	05	04	06	07
Montgomery,	80	55	35	60	60	9 50	12 50	140 00	135 00	40 00	3 50	3 50	05	04	06	07
Montour,	85	55	35	60	60	12 50	15 00	120 00	.....	30 00	4 25	5 00	05	04	06	06
Northampton,	1 00	60	35	70	55	12 50	15 00	125 00	125 00	30 00	4 50	4 50	05	04	06	07
Northumberland,	85	50	30	60	60	10 50	13 00	140 00	145 00	35 00	4 00	5 00	05	04	06	07
Perry,	80	45	30	55	50	8 50	11 00	125 00	125 00	30 00	4 00	5 00	05	04	06	07
Philadelphia,	95	55	45	65	65	14 00	15 00	130 00	125 00	45 00	4 00	4 00	05	04	05	07
Pike,	85	60	35	70	60	12 50	14 50	135 00	150 00	25 00	4 00	3 75	04	03	07	06
Potter,	1 00	60	32	.....	50	7 00	9 00	150 00	100 00	30 00	3 50	3 00	06	05	05	07
Schuylkill,	85	65	40	60	60	12 50	15 00	125 00	130 00	35 00	4 50	3 50	05	04	06	07
Snyder,	80	50	35	60	55	10 00	11 50	150 00	140 00	35 00	4 00	4 50	05	04	06	08
Somerset,	95	55	40	70	55	8 00	10 00	150 00	130 00	35 00	1 50	4 00	04	03	07	08
Sullivan,	95	55	40	55	50	9 00	11 00	110 00	115 00	30 00	4 00	4 50	04	03	05	06
Susquehanna, .....	.....	65	40	65	60	9 00	10 00	120 00	125 00	30 00	3 50	3 50	04	03	05	06
Tioga,	90	60	35	70	60	7 00	9 00	115 00	130 00	30 00	4 50	5 00	04	03	06	06
Union,	1 00	55	32	55	55	10 00	12 00	130 00	125 00	35 00	4 00	3 50	05	04	05	06
Venango,	1 00	65	35	60	60	10 00	12 00	150 00	130 00	35 00	4 00	4 00	05	04	05	06
Warren,	1 00	60	40	75	55	10 00	11 50	125 00	.....	35 00	4 00	4 00	05	04	05	06
Washington,	80	55	40	.....	60	9 50	11 50	125 00	150 00	35 00	4 00	4 00	04	03	05	06
Wayne, .....	.....	65	44	.....	65	10 00	11 50	125 00	150 00	40 00	4 50	5 00	05	04	05	05
Westmoreland,	90	65	40	75	.....	12 00	10 00	130 00	.....	30 00	4 50	5 00	05	04	07	08
Wyoing,	1 00	50	40	65	55	9 00	11 00	120 00	170 00	35 00	3 50	4 00	04	03	05	06
York,	80	60	35	60	60	10 00	13 00	125 00	150 00	35 00	4 00	4 00	05	04	05	07
Average,	\$0 88	\$0 57	\$0 37	\$0 63	\$0 56	\$10 00	\$12 00	\$131 00	\$139 00	\$35 00	\$3 95	\$4 10	\$0 04 3-5	\$0 03½	\$0 05¼	\$0 06¼

CROP REPORTS FOR 1905—Continued.

Counties.	Live Stock.		Vegetables, Fruit, Etc.											Eggs, per dozen.	Tobacco, leaf, per pound.	Honey, per pound.
	Chickens, dressed, per pound.	Chickens, live, per pound.	Apples, per bushel.	Peaches, per bushel.	Pears, per bushel.	Plums, per quart.	Cherries, per quart.	Blackberries, per quart.	Raspberries, per quart.	Potatoes, per bushel.	Butter, per pound at store.	Butter, per pound at market.	Milk, wholesale, 100 pounds.	Milk, retail, per quart.		
Adams,	\$0 15	\$0 10	\$0 55	\$0 50	\$0 75	\$0 06	\$0 07	\$0 06	\$0 08	\$0 45	\$0 20	\$0 22	\$0 80	\$0 05	\$0 20	\$0 20
Allegheny,	15	12	80	1 00	1 00	10	10	08	08	75	24	28	1 30	05	20	15
Armstrong,	16	11	1 00	1 85	1 00	06	07	08	09	60	22	26	1 70	06	22	18
Beaver,	20	14	1 20	1 15	1 00	10	10	08	12	70	25	30	.....	08	25	25
Bedford,	12	08	60	75	75	04	05	05	05	60	20	22	.....	05	20	15
Berks,	18	09	75	80	75	06	08	06	08	60	20	28	1 10	05	24	12
Blairstown,	16	14	90	90	75	05	06	08	10	70	24	28	.....	05	25	24
Bradford,	12	09	75	80	75	06	08	06	08	60	18	22	1 30	05	24	20
Bucks,	15	12	60	1 00	1 00	10	09	07	08	55	22	26	1 00	05	26	20
Butler,	15	10	1 25	.....	1 25	10	10	12	12	60	25	25	.....	06	25	20
Cambria,	16	10	80	1 50	1 25	10	09	08	09	65	23	28	.....	06	25	20
Carbon,	17	11	1 00	80	1 25	08	08	08	10	70	25	28	.....	06	26	18
Centre,	12	08	55	1 00	1 00	08	06	06	07	50	18	22	.....	05	20	18
Chester,	16	12	60	1 25	60	08	10	08	12	60	25	30	2 50	05	30	20
Clarion,	14	09	60	1 00	75	07	07	09	10	60	23	25	1 00	05	33	15
Clearfield,	16	12	80	1	1 50	12	11	12	12	65	24	28	.....	06	38	15
Columbia,	13	10	55	70	1 00	06	06	08	10	50	24	28	1 20	06	38	18
Crawford,	14	09	70	70	80	09	10	09	11	50	20	24	.....	06	30	16
Cumberland,	14	10	50	75	75	05	06	06	07	45	18	22	1 20	05	19	17
Dauphin,	15	10	40	90	60	04	06	05	07	45	20	23	1 25	05	20	14
Delaware,	16	12	70	1 00	90	08	10	09	06	70	28	32	1 10	05	22	20
Elk,	18	12	90	1 50	1 15	06	08	07	09	65	22	25	1 00	05	30	25
Erie,	17	11	65	50	75	06	08	07	08	60	22	26	1 50	06	25	15
Fayette,	14	11	1 00	1 10	80	10	10	10	09	75	24	27	.....	05	25	22
Forest,	13	09	1 00	1 75	1 50	10	12	06	09	80	20	24	.....	05	22	15

Franklin,	13	10	50	75	95	07	05	07	45	21	24	90	05	20	12	13
Fulton,	13	09	40	70	75	08	05	06	50	15	20	.....	05	20	.....	12
Greene,	14	09	20	1 50	1 25	08	08	08	55	20	22	.....	05	20	.....	18
Huntingdon,	13	08	50	75	90	10	05	05	50	23	25	.....	06	20	.....	13
Indiana,	12	09	80	1 00	1 25	08	06	07	50	20	22	.....	06	21	.....	15
Jefferson,	14	09	80	80	1 25	05	07	08	45	20	22	.....	06	20	.....	15
Junata,	13	09	45	50	70	08	05	05	50	17	.....	.....	05	20	10	12
Lackawanna,	15	12	80	1 00	75	05	10	10	65	23	25	1 15	05	28	.....	12
Lancaster,	15	11	60	75	75	07	08	06	55	22	25	1 00	05	24	10	20
Lawrence,	16	12	1 00	1 00	1 50	09	07	08	65	20	25	1 10	05	26	.....	20
Lebanon,	12	10	60	75	1 00	07	08	08	65	20	24	1 10	05	25	10	20
Lehigh,	16	12	70	75	75	08	08	08	50	22	26	1 20	05	20	.....	15
Luzerne,	17	12	80	90	1 00	10	09	10	70	24	29	1 80	06	25	.....	15
Lycoming,	18	12	70	75	.....	08	08	08	60	24	28	.....	05	24	.....	13
McKean,	14	10	75	.....	.....	.....	09	09	60	19	25	1 00	05	21	.....	16
Mercer,	15	12	65	70	70	05	06	07	50	19	23	1 10	05	21	.....	15
Mifflin,	12	09	60	60	90	07	07	08	55	22	25	1 50	05	21	.....	15
Monroe,	13	10	65	1 10	70	05	06	07	65	22	26	1 40	05	22	.....	18
Montgomery,	16	12	50	80	60	07	08	08	27	21	30	1 60	06	21	.....	18
Montour,	14	11	45	85	75	09	08	10	55	22	26	1 50	06	21	.....	16
Northampton,	14	10	60	80	70	06	09	10	50	22	26	1 10	06	24	.....	15
Northumberland,	16	12	65	80	1 50	08	07	06	60	26	28	2 00	06	25	.....	15
Perry,	13	10	45	45	70	07	06	06	50	19	21	.....	05	23	.....	16
Philadelphia,	17	12	90	.....	.....	.....	.....	.....	90	26	32	.....	07	30	.....	15
Pike,	15	10	55	70	1 25	08	07	06	60	21	25	.....	05	24	.....	14
Potter,	15	11	50	65	70	06	07	07	65	25	25	1 00	05	22	12	20
Schuylkill,	16	12	80	85	80	05	06	07	55	23	27	1 60	06	24	.....	14
Snyder,	13	09	45	75	65	06	06	08	50	20	24	80	05	22	.....	16
Somerset,	15	10	70	1 25	1 00	07	08	08	65	18	20	1 10	05	21	.....	12
Sullivan,	12	08	65	80	1 00	05	06	09	55	22	24	.....	05	22	.....	12
Susquehanna,	14	10	60	1 10	1 10	08	08	08	65	23	25	1 50	05	25	.....	13
Tioga,	14	10	75	1 40	1 25	05	10	10	65	23	25	1 10	05	28	12	15
Union,	14	10	65	60	60	07	05	07	45	22	25	1 50	05	20	.....	15
Venango,	14	10	60	65	60	05	05	08	55	21	25	1 50	05	20	.....	15
Warren,	15	11	1 00	85	1 00	07	10	08	65	22	25	1 25	05	22	.....	13
Washington,	16	12	1 10	1 25	1 25	10	08	08	70	22	24	1 00	06	25	.....	14
Wayne,	18	12	65	1 00	1 15	08	07	09	65	22	25	1 15	05	24	.....	12
Westmoreland,	16	12	80	90	1 00	05	08	08	60	23	26	.....	06	23	.....	18
Wyoming,	16	13	70	80	60	07	08	08	70	23	25	.....	05	20	.....	10
York,	14	10	55	80	75	08	08	08	45	20	25	1 50	05	20	.....	20
Average,	\$0 15	\$0 10½	\$0 70	\$0 90	\$0 90	\$0 07 1-5	\$0 08	\$0 07½	\$0 59	\$0 22	\$0 25	\$1 30	\$0 05½	\$0 24	\$0 11	\$0 16

CROP REPORTS FOR 1905—Continued.

Counties.	Wool.						Farm Land, Value per Acre.		Farm Wages.												
	Short, unwashed.		Short, washed.		Medium, unwashed.		Medium, washed.		Long, unwashed.		Long, washed.		Improved.	Average.	By year, with board.	Summer months only.	By day, with board.	By day, without board.	Whole year, without board.	Harvest, by day.	Household help, female, with board, per week.
Adams,	\$0 22	\$0 25	\$0 28	\$0 32	\$0 20	\$0 30	\$35 00	\$20 00	\$185 00	\$18 00	\$1 00	\$1 25	\$250 00	\$1 50	\$2 00	\$2 00	\$1 50	\$250 00	\$1 50	\$2 00	\$2 00
Allegheny,	26	30					100 00	60 00	200 00	22 00	1 00	1 50	300 00	1 75	3 00	3 00	1 75	300 00	1 50	3 00	3 00
Armstrong,							40 00	35 00	220 00	22 00	1 00	1 50	300 00	1 50	2 50	2 50	1 50	300 00	1 50	2 50	2 50
Beaver,	25	30	28	32	30	36	35 00	28 00	220 00	20 00	1 00	1 60	275 00	1 50	2 50	2 50	1 50	300 00	1 50	2 50	2 50
Bedford,	30	35	25	32	30	35	40 00	25 00	180 00	18 00	75	1 15	240 00	1 50	2 00	2 00	1 15	240 00	1 50	2 00	2 00
Berks,							50 00	35 00	180 00	20 00	1 00	1 25	280 00	1 75	2 50	2 50	1 75	280 00	1 50	2 00	2 00
Blair,							60 00	50 00	160 00	18 00	1 00	1 25	280 00	1 75	2 50	2 50	1 75	280 00	1 50	2 00	2 00
Bradford,	22	26	28	31	32	40	40 00	25 00	180 00	20 00	1 00	1 25	250 00	1 75	2 50	2 50	1 75	250 00	1 75	2 50	2 50
Bucks,							50 00	35 00	180 00	20 00	1 00	1 35	300 00	1 50	3 00	3 00	1 50	300 00	1 50	3 00	3 00
Butler,							35 00	25 00	240 00	24 00	1 25	1 75	360 00	1 75	3 00	3 00	1 75	360 00	1 75	3 00	3 00
Cambridia,							35 00	20 00	250 00	25 00	1 25	1 50	360 00	2 00	3 00	3 00	2 00	360 00	2 00	3 00	3 00
Cameron,							60 00	40 00	200 00	20 00	1 20	1 50	300 00	1 50	2 00	2 00	1 50	300 00	1 50	2 00	2 00
Carbon,							30 00	20 00	150 00	17 00	1 00	1 25	225 00	1 40	1 50	1 50	1 25	225 00	1 40	1 50	1 50
Centre,	22	30	22	32	24	32	90 00	55 00	180 00	18 00	1 00	1 25	240 00	1 40	1 50	1 50	1 25	240 00	1 40	1 50	1 50
Chester,							45 00	20 00	200 00	18 00	1 00	1 50	250 00	1 75	2 50	2 50	1 50	250 00	1 75	2 50	2 50
Clarion,							30 00	15 00	240 00	22 00	1 00	1 40	300 00	1 75	2 50	2 50	1 75	300 00	1 75	2 50	2 50
Cleardale,							65 00	50 00	180 00	18 00	1 00	1 25	260 00	1 50	2 00	2 00	1 25	260 00	1 50	2 00	2 00
Clinton,							60 00	45 00	260 00	20 00	1 00	1 25	300 00	1 50	2 00	2 00	1 25	300 00	1 50	2 00	2 00
Columbia,							30 00	20 00	180 00	18 00	1 00	1 25	300 00	1 75	2 50	2 50	1 75	300 00	1 75	2 50	2 50
Crawford,	27	36	28	36	29	37	30 00	20 00	180 00	18 00	1 00	1 25	300 00	1 75	2 50	2 50	1 75	300 00	1 75	2 50	2 50
Cumberland,	28	35	30	36	32	37	75 00	50 00	150 00	16 00	1 00	1 25	240 00	1 50	2 00	2 00	1 25	240 00	1 50	2 00	2 00
Dauphin,	25		28		30		85 00	55 00	150 00	17 00	1 00	1 25	275 00	1 50	2 00	2 00	1 25	275 00	1 50	2 00	2 00
Delaware,							125 00	85 00	220 00	20 00	1 00	1 40	350 00	2 00	3 00	3 00	1 40	350 00	2 00	3 00	3 00
Elk,							45 00	30 00	200 00	20 00	1 00	1 25	350 00	1 50	2 00	2 00	1 25	350 00	1 50	2 00	2 00
Erie,							55 00	35 00	240 00	24 00	1 25	1 50	360 00	1 75	2 75	2 75	1 50	360 00	1 75	2 75	2 75

Fayette,	25	30	32	34	32	38	75 00	50 00	225 00	25 00	1 15	1 40	385 00	1 75	3 00
Forest,	18	24	19	24	22	28	39 00	15 00	240 00	25 00	1 25	1 50	300 00	1 75	3 00
Franklin,	23	34	27	32	28	34	95 00	60 00	175 00	15 00	1 00	1 50	250 00	1 50	1 75
Fulton,	25	30	22	28	28	32	45 00	30 00	140 00	15 00	75	1 00	175 00	1 40	1 75
Greene,	26	33	28	33	28	35	65 00	50 00	175 00	18 00	1 00	1 25	250 00	1 50	2 00
Huntingdon, .....	.....	.....	.....	.....	.....	.....	30 00	20 00	150 00	16 00	1 75	1 00	240 00	1 25	2 00
Indiana,	22	28	24	30	24	31	40 00	30 00	175 00	20 00	1 00	1 25	260 00	1 50	2 50
Jefferson,	19	28	18	27	.....	.....	45 00	25 00	150 00	18 00	1 00	1 40	300 00	1 50	2 00
Junata, .....	.....	.....	.....	.....	.....	.....	40 00	25 00	180 00	17 00	1 00	1 25	300 00	1 50	1 50
Lackawanna, .....	.....	.....	.....	.....	.....	.....	60 00	40 00	180 00	20 00	1 10	1 50	320 00	1 75	2 50
Lancaster,	27	38	33	40	30	40	100 00	80 00	200 00	20 00	1 00	1 25	300 00	1 75	2 50
Lawrence,	25	32	28	38	30	38	50 00	40 00	200 00	20 00	1 00	1 25	320 00	1 75	2 50
Lebanon,	25	30	.....	.....	.....	.....	55 00	.....	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Lehigh, .....	.....	.....	.....	.....	.....	.....	70 00	45 00	180 00	18 00	1 00	1 25	310 00	1 50	2 00
Luzerne, .....	.....	.....	.....	.....	.....	.....	60 00	40 00	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Lycoming, .....	.....	.....	.....	.....	.....	.....	60 00	45 00	200 00	20 00	1 00	1 50	300 00	1 75	2 50
McKean, .....	.....	.....	.....	.....	.....	.....	35 00	20 00	180 00	20 00	1 00	1 40	280 00	1 75	2 50
Mercer,	25	30	26	31	26	31	40 00	30 00	200 00	20 00	1 00	1 40	290 00	1 60	3 00
Mifflin, .....	.....	.....	.....	.....	.....	.....	75 00	50 00	175 00	18 00	85	1 15	250 00	1 40	2 00
Monroe, .....	.....	.....	.....	.....	.....	.....	40 00	25 00	175 00	18 00	1 00	1 25	280 00	1 40	2 50
Montgomery, .....	.....	.....	.....	.....	.....	.....	75 00	50 00	240 00	24 00	1 25	1 50	360 00	1 50	3 00
Montour, .....	.....	.....	.....	.....	.....	.....	60 00	40 00	170 00	16 00	1 00	1 25	250 00	1 50	2 50
Northampton, .....	.....	.....	.....	.....	.....	.....	65 00	45 00	160 00	16 00	1 00	1 50	300 00	1 50	2 00
Northumberland, .....	.....	.....	.....	.....	.....	.....	60 00	40 00	160 00	18 00	1 00	1 35	280 00	1 50	2 50
Perry, .....	.....	.....	.....	.....	.....	.....	55 00	40 00	150 00	15 00	1 00	1 25	300 00	1 25	2 00
Philadelphia, .....	.....	.....	.....	.....	.....	.....	100 00	70 00	280 00	25 00	1 25	1 75	380 00	2 00	3 50
Pike,	24	28	28	32	32	34	40 00	20 00	180 00	18 00	1 00	1 25	300 00	1 50	2 50
Potter,	28	32	25	32	30	35	40 00	25 00	240 00	25 00	1 00	1 50	360 00	1 75	2 50
Schuylkill, .....	.....	.....	.....	.....	.....	.....	45 00	35 00	290 00	18 00	1 00	1 25	300 00	1 50	2 50
Snyder, .....	.....	.....	.....	.....	.....	.....	70 00	50 00	160 00	15 00	75	1 00	225 00	1 25	2 00
Somerset, .....	.....	.....	.....	.....	.....	.....	40 00	25 00	200 00	20 00	1 00	1 25	300 00	1 50	2 50
Sullivan, .....	.....	.....	.....	.....	.....	.....	45 00	25 00	150 00	18 00	1 00	1 40	300 00	1 50	2 50
Susquehanna, .....	.....	.....	.....	.....	.....	.....	30 00	20 00	180 00	18 00	1 00	1 25	240 00	1 75	2 00
Tioga, .....	.....	.....	.....	.....	.....	.....	35 00	25 00	200 00	20 00	1 25	1 50	300 00	1 75	2 50
Union, .....	.....	.....	.....	.....	.....	.....	80 00	50 00	150 00	17 00	1 00	1 25	280 00	1 75	2 50
Venango, .....	.....	.....	.....	.....	.....	.....	30 00	20 00	180 00	20 00	1 00	1 40	260 00	1 75	2 50
Warren, .....	.....	.....	.....	.....	.....	.....	30 00	20 00	200 00	20 00	1 25	1 50	350 00	1 75	3 00
Washington, .....	.....	.....	.....	.....	.....	.....	80 00	65 00	210 00	20 00	1 00	1 25	300 00	1 75	3 50
Wayne,	20	30	22	32	21	31	40 00	20 00	240 00	20 00	1 00	1 25	310 00	1 75	3 00
Westmoreland, .....	.....	.....	.....	.....	.....	.....	65 00	45 00	220 00	24 00	1 25	1 50	350 00	1 75	3 00
Wyoming, .....	.....	.....	.....	.....	.....	.....	60 00	45 00	200 00	20 00	1 15	1 40	300 00	1 75	3 00
York, .....	.....	.....	.....	.....	.....	.....	40 00	25 00	210 00	18 00	1 00	1 25	300 00	1 50	2 50
Average,	\$0 25	\$0 31	\$0 26	\$0 32	\$0 28	\$0 34	\$55 00	\$35 00	\$190 00	\$19 00	\$1 00	\$1 35	\$295 00	\$1 60	\$2 50

The following gives the acreage, amount produced and value of Cereals and Hay grown in Pennsylvania; also the number and value of the different Farm Animals and Pennsylvania's rank among the different states of the Union for the various products enumerated, in the year 1904.

CEREAL AND HAY PRODUCTS.

	Acreage.	Production.	Value.	Standing.
Rye,	346,265	5,367,108 bushels.	\$3,810,647	1st.
Potatoes,	256,361	27,174,266 bushels.	14,674,104	2nd.
Buckwheat,	244,629	4,599,025 bushels.	2,887,386	2nd.
Wheat,	1,550,210	21,857,961 bushels.	23,606,598	8th.
Corn,	1,427,322	48,535,748 bushels.	28,636,091	12th.
Oats,	1,172,915	39,761,818 bushels.	15,109,491	6th.
Hay,	3,103,052	4,499,425 tons.	53,183,204	2nd.
Total,			\$141,907,521	

FARM ANIMALS.

	Number.	Value.	Standing.
Horses,	607,506	\$56,230,811	6th.
Mules,	38,532	3,848,129	18th.
Milch cows,	1,086,723	32,503,885	3rd.
Other cattle,	774,496	12,350,887	17th.
Sheep,	895,982	3,415,394	14th.
Hogs,	980,080	8,115,062	10th.
Total,		\$116,464,158	

The following comparison of these tables for the past four years, shows an almost uniform advance in the various products of Pennsylvania:

TABLE OF CAMPARISON.

	1902.	1903.	1904.	1905.
Wheat, :.....	\$0.73	\$0.75	\$1.08	\$0.83
Corn, .....	.45	.57	.62	.57
Oats, .....	.37	.41	.44	.37
Rye, .....	.53	.60	.70	.63
Buckwheat, .....	.43	.57	.78	.56
Hay, clover,	9.43	11.40	10.50	10.00
Hay, timothy,	10.47	14.00	12.00	12.00
Horses, average,	84.00	115.00	120.00	131.00
Mules, average,	77.00	120.00	125.00	139.00
Cows, average,	28.00	33.00	35.00	35.00
Lambs, average,	2.76	3.50	3.50	3.95
Ewes, average,	2.81	3.45	3.50	4.10
Steers, fat, per pound, .....	.05	.04	.04½	.04
Steers for feeding, per pound, .....	.03	.03	.03½	.03
Swine, shoats, per pound, .....	.06	.06	.06	.05
Hogs, fat, per pound, .....	.06	.06	.06½	.06
Chickens, dressed, per pound, .....	.11	.14	.13	.15
Chickens, live, per pound, .....	.08	.10	.10	.10
Apples, per bushel, .....	.35	.50	.44	.70
Peaches, per basket, .....	.75	1.15	.82	.90
Pears, per bushel, .....	.81	.98	.94	.90
Plums, per quart, .....	.06	.07	.08	.07
Cherries, per quart, .....	.06	.08	.08	.08
Blackberries, per quart, .....	.07	.07	.08	.07
Raspberries, per quart, .....	.08	.08	.09	.08
Potatoes, per bushel, .....	.59	.58	.52	.59
Butter, per pound, at store, .....	.18	.24	.22	.22
Butter, per pound, at market, .....	.22	.24	.24	.25
Milk, wholesale, per 100 pounds,	1.16	1.41	1.50	1.30
Milk, retail, per quart, .....	.05	.05	.05	.05
Eggs, per dozen, .....	.18	.22	.24	.24
Wool, short, unwashed, .....	.16	.18	.21	.25
Wool, short, washed, .....	.17	.24	.28	.31
Wool, medium, unwashed, .....	.17	.18	.22	.26
Wool, medium, washed, .....	.20	.25	.30	.32
Wool, long, unwashed, .....	.15	.19	.23	.28
Wool, washed, .....	.24	.25	.31	.34
Farm land, value per acre,	49.00	56.50	57.00	55.00
Farm land, value per acre, average,	33.00	39.00	37.00	35.00
Farm wages by year, with board,	153.00	187.00	185.00	190.00
Farm wages, summer months only,	17.00	20.00	20.00	19.00
Farm wages, by day, with board, .....	.86	1.00	1.00	1.00
Farm wages, by day, without board,	1.15	1.40	1.35	1.35
Farm wages, whole year, without board,	196.00	280.00	300.00	295.00
Farm wages, harvest, by day,	1.23	1.55	1.60	1.60
Farm wages, household help, female,	2.05	2.35	2.50	2.50

AGRICULTURAL SOCIETIES.

The various agricultural societies within the State show a marked improvement in their management, especially in agricultural products, which, at many of these fairs, are given a prominent place in the exhibits. Games of chance and gambling devices are being rapidly eliminated from these fairs, and as the active farmers in the different counties assume control of these organizations, the standing, as real agricultural fairs, will become recognized by the general public.

The attendance for 1904 was 1,267,803, previous year 1,101,055, making an increase of 166,748; total membership, 10,513, previous year 9,848, making an increase of 664; paid up membership fees, \$11,382.15, previous year \$12,020.00, making a decrease of \$629.92; amount paid in premiums, \$101,326.46, previous year \$87,120.65, making an increase of \$14,205.91; amount of offered premiums this year, \$102,100.00, previous year \$126,110.00, making a decrease of \$24,010.00.

List of County and Local Agricultural Societies and Dates for Holding Fall Exhibitions of 1905, Etc.

County.	Corporate Name of Society.	Attendance, 1904.	Race track.	Membership.		Premiums.		Held 1905.	
				Number.	Fee.	Paid, 1904.	Offered 1905.	Place.	Date.
	Pennsylvania State Agricultural Society, ..	.....	.....	500	\$60 00	.....	.....	.....	No fair.
	State Horticultural Association of Penn- sylvania.	.....	.....	125	.....	.....	.....	.....	No fair.
	Inter-State Picnic Exhibition,	60,000	.....	8	.....	.....	.....	Williams Grove, ..	Aug. 28-Sept. 2.
	Patrons of Husbandry Exhibition,	12,000	.....	.....	.....	.....	.....	Grange Park, ..	Sept. 16-22.
	.....	.....	.....	.....	.....	.....	.....	Centre Hall.	.....
Adams,	Adams County Agricultural Association, ..	.....	.....	38	.....	.....	.....	.....	No fair.
Armstrong,	Dayton Agricultural and Mechanical As- sociation.	15,000	1-3 mile,	250	28 00	\$1,737 95	\$3,500 00	Dayton,	Sept. 26-29.
	Armstrong County Fair Association,	40,000	½ mile, ..	.....	Stock co.	2,299 50	2,500 00	Kittanning,	Aug. 15-18.
Beaver,	Beaver County Agricultural Society,	15,000	½ mile, ..	132	132 00	3,075 00	.....	Beaver Falls,	No fair.
Bedford,	Bedford County Agricultural Society,	12,000	½ mile, ..	242	.....	548 00	.....	Bedford,	Oct. 3-5.
Berks,	Agricultural and Horticultural Association of Berks County.	55,000	½ mile, ..	208	280 00	2,400 00	3,000 00	Reading,	Oct. 3-6.
	Bradford County Agricultural Society,	25,000	½ mile, ..	250	.....	1,700 00	3,500 00	Towanda,	Sept. 26-29.
Bradford,	Troy Agricultural Society,	10,000	½ mile, ..	10	Stock co.	750 00	2,500 00	Troy,	Sept. 12-15.
Butler,	Butler Driving and Fair Association,	30,000	½ mile, ..	330	.....	2,725 61	3,500 00	Butler,	Aug. 22-25.
Cambria,	Ebensburg Agricultural Society, .....	.....	½ mile, ..	.....	.....	.....	.....	.....	No fair.
	Cambria County Agricultural Association, ..	.....	½ mile, ..	375	3,750 00	.....	.....	Carrolltown,	Sept. 5-8.
Cameron,	Cameron County Agricultural Society,	600	.....	.....	.....	.....	.....	Keystone Park,	Oct. 6-7.
Carbon,	Carbon County Industrial Society,	18,000	½ mile, ..	.....	Stock co.	287 00	Not de- cided.	Leighton,	Aug. 29-Sept. 1.
	Centre County Agricultural Exhibiting Company.	20,000	½ mile, ..	12	.....	750 00	.....	Bellefonte,	Oct. 3-6.
Chester,	Chester County Agricultural Association, ..	.....	½ mile, ..	135	375 00	.....	.....	West Chester,	Sept. 12-15.
Chester,	Oxford Agricultural Society,	6,000	½ mile, ..	.....	Stock co.	1,000 00	1,000 00	Oxford,	Sept. 27-29.
Clarion,	Clarion County Fair Association,	15,000	½ mile, ..	200	.....	2,100 00	3,000 00	Clarion,	Sept. 12-15.

Clinton,	Clinton County Agricultural Society,	30,303	1/2 mile, ..	300	300 00	6,300 00	7,000 00	.....	.....	No fair.
Columbia,	Columbia County Agricultural, Horticultural and Mechanical Association.	14,000	1-3 mile, ..	.....	.....	1,000 00	1,500 00	.....	.....	Oct. 10-13.
Crawford,	Central Crawford Agricultural Society, ...	20,000	1/2 mile, ..	.....	.....	3,500 00	4,000 00	.....	.....	Aug. 22-25.
Cumberland,	Agricultural Association of Cumberland County.	15,000	1/2 mile, ..	.....	.....	1,940 50	3,000 00	.....	.....	Sept. 26-29.
Dauphin,	Middletown Fair Association,	5,000	1/2 mile, ..	19	100 00	950 00	950 00	.....	.....	Sept. 5-8.
Dauphin,	Gratz Agricultural and Horticultural Association.	7,000	1/2 mile, ..	340	1,821 15	650 00	800 00	.....	.....	Sept. 20-23.
Erie,	Wattsburg Agricultural Society, .....	.....	1/2 mile, ..	75	50	.....	.....	.....	.....	Sept. 5-8.
Forest,	Forest County Agricultural Society,	5,000	1-3 mile, ..	160	160 00	2,500 00	2,500 00	.....	.....	No fair.
Greene,	Greene County Agricultural and Manufacturing Society.	30,000	1/2 mile, ..	80	.....	.....	.....	.....	.....	Sept. 26-29.
Indiana,	Indiana County Agricultural Society,	25,000	1/2 mile, ..	16	.....	3,500 00	4,000 00	.....	.....	Sept. 12-15.
Jefferson,	Jefferson County Agricultural Society and Driving Park Association.	4,000	1/2 mile, ..	150	50	885 15	.....	.....	.....	Sept. 5-8.
Jefferson,	Punxsutawney Fair Association,	5,000	1/2 mile, ..	.....	.....	1,200 00	600 00	.....	.....	Aug. 29-Sept. 1.
Juniata,	Juniata County Agricultural Society, .....	.....	1/2 mile, ..	.....	.....	.....	.....	.....	.....	Sept. 13-15.
Lackawanna,	Lackawanna County Agricultural Society,	1,000	.....	44	220 00	325 00	300 00	.....	.....	No fair.
Lackawanna,	Maitland Driving Park and Agricultural Society.	.....	1/2 mile, ..	.....	.....	.....	.....	.....	.....	Sept. 11-14.
Lackawanna,	Lackawanna Grange Fair Association, ...	.....	.....	.....	.....	.....	.....	.....	.....	Sept. 28-29.
Lancaster,	Lancaster County Agricultural and Horticultural Society.	.....	.....	.....	.....	.....	.....	.....	.....	No fair.
Lawrence,	Lawrence County Agricultural and Horticultural Society and Farmers' Institute.	.....	.....	.....	.....	.....	.....	.....	.....	No fair.
Lawrence,	Pulaski Fair Association,	23,000	1/2 mile, ..	.....	.....	4,500 00	5,500 00	.....	.....	Aug. 29-Sept. 1.
Lebanon,	Lebanon Valley Fair Association,	50,000	1/2 mile, ..	500	20 00	.....	.....	.....	.....	Aug. 30-Sept. 1.
Lebanon,	Agricultural and Horticultural Association of Lebanon County.	.....	.....	.....	.....	.....	.....	.....	.....	No fair.
Lehigh,	Lehigh County Agricultural Society,	150,000	1/2 mile, ..	882	.....	18,000 00	18,000 00	.....	.....	Sept. 19-22.
Luzerne,	Dallas Union Agricultural Association, ...	15,000	1/2 mile, ..	223	Stock co.	1,600 00	4,800 00	.....	.....	Oct. 3-6.
Lycoming,	Muncy Valley Farmers' Club, .....	.....	.....	.....	.....	.....	.....	.....	.....	Sept. 19-22.
Mercer,	Mercer County Agricultural Society,	30,000	1/2 mile, ..	300	.....	4,000 00	5,000 00	.....	.....	Sept. 5-8.
Mercer,	Mercer Central Agricultural Society,	22,000	1/2 mile, ..	.....	.....	.....	3,500 00	.....	.....	Sept. 12-14.
Mifflin,	Mifflin County Agricultural Fair Association.	.....	1/2 mile, ..	.....	.....	.....	.....	.....	.....	No fair.
Monroe,	Monroe County Agricultural Society,	8,000	1/2 mile, ..	.....	.....	2,500 00	2,500 00	.....	.....	Aug. 29-Sept. 1.
Montour,	Montour County Agricultural Society, ...	50,000	1/2 mile, ..	325	.....	.....	.....	.....	.....	No fair.
Northampton, ...	Northampton County Agricultural Society,	50,000	1/2 mile, ..	40	.....	2,398 60	7,000 00	.....	.....	Sept. 12-15.
Northampton, ...	Pennsylvania State Fair Association,	20,000	1/2 mile, ..	.....	.....	3,000 00	3,000 00	.....	.....	Sept. 5-8.
Northumberland, ..	Milton Fair Association,	6,000	1/2 mile, ..	.....	.....	1,100 00	1,650 00	.....	.....	Oct. 3-6.
Perry,	Perry County Agricultural Society, .....	.....	1/2 mile, ..	.....	.....	1,300 00	1,650 00	.....	.....	Sept. 19-22.

List of County and Local Agricultural Societies and Dates for Holding Fall Exhibitions of 1905, Etc.—Continued.

County.	Corporate Name of Society.	Attendance, 1904.	Race track.	Membership.		Premiums.		Held 1905.
				Number.	Fee.	Paid, 1904.	Offered 1905.	
Philadelphia,	Pennsylvania Horticultural Society, .....	.....	.....	860	1,800 00	2,800 00	3,500 00	Horticultural Hall, Philadelphia.
Schuylkill,	Orwigsburg Agricultural and Horticultural Association. ....	.....	.....	.....	.....	.....	.....	No fair.
Somerset,	Somerset County Agricultural Society, .....	.....	.....	25	15 00	.....	.....	No fair.
Sullivan,	Sullivan County Agricultural Society,	3,500	1-3 mile,	58	45 00	313 40	700 00	Oct. 3-5.
Susquehanna, ...	Susquehanna County Agricultural Society, ...	5,000	.....	46	10 00	800 00	800 00	Sept. 13-14.
Susquehanna,	Harford Agricultural Society,	10,000	.....	100	.....	900 0	1,100 00	Sept. 27-28.
Tioga,	Cowanesque Valley Agricultural Society,	45,000	1½ mile, .....	.....	.....	1,000 00	1,000 00	Sept. 12-15.
Tioga,	Smythe Park Association, .....	.....	1½ mile,	500	Stock co.	1,478 00	3,500 00	Sept. 19-22.
Tioga,	Tioga County Pomona Grange No. 30, .....	.....	1½ mile,	2,000	250 00	.....	.....	No fair.
Washington,	Union Agricultural Association,	15,000	1-3 mile, .....	.....	2,000 00	3,136 15	Not de- cided.	Oct. 3-5.
Warren,	Warren County Farmers' and Breeders' Association. ....	.....	.....	60	30 00	.....	.....	Not decided.
Wayne,	Wayne County Agricultural Society,	12,000	1½ mile,	15	.....	1,497 00	2,600 00	Not decided.
Westmoreland, ...	Westmoreland Agricultural Society,	15,000	1½ mile,	82	25 00	2,219 60	Not de- cided.	Sept. 13-15.
Wyoming,	Wyoming County Agricultural Society,	3,000	1½ mile, .....	.....	.....	1,000 00	.....	Sept. 13-15.
York,	York County Agricultural Society,	80,000	1½ mile,	198	.....	4,600 00	9,500 00	Oct. 2-6.
York,	Hanover Agricultural Society,	18,000	1½ mile,	150	Stock co.	1,050 00	2,000 00	Sept. 12-15.
	Total	1,267,803	.....	10,513	\$11,392 15	\$101,326 46	\$102,100 00	

Note.—Where dates etc., are omitted, no replies to requests for same were received by this Department.

CONCLUSION.

As a matter of historical record amongst all civilized nations, the fostering of agriculture by wholesome laws and equipments for soil improvement, plant cultivation, animal breeding and improvement has formed the basis upon which the upward trend of commercial stability and strength has rested for the past century at least. Stupendous is the value of all the coal, gas and oil lying beneath the surface soil of Pennsylvania, yet one upper foot of cultivated and fertilized soil is more valuable than all the minerals, because the soil represents agriculture and agriculture stands for that which gives food for hungry humanity and keeps transportation companies busy carrying farm products to the various distributing centres in both the State, Nation and throughout the world. We note with just pride that many of our intelligent farmers received fair recognition in the Agricultural Exhibit at the Louisiana Purchase Exposition, amongst which Lancaster county took prize on tobacco, Butler and Washington on wool and many other counties on different farm products. Possibly, the most sweeping prize of all was awarded Mr. Samuel McCreary, county chairman of institutes of Lawrence county, for best exhibit of wheat, rye, corn and oats. These cereals after having taken first prize in our own State exhibit were placed in Grand Sweep Stakes Contest and were awarded the first premium, a medal. We make mention of these facts in order to more completely fortify the fact that Pennsylvania is indeed one of the most important agricultural states; which truth is verified when she comes in competition with other states that are noted exclusively as agricultural in their pursuits.

The farmers are to-day seeking more earnestly than ever before for light and knowledge in the science of agriculture. Its mysteries are deep, for they are clothed in Nature's garb in soil, plant and animal. Herein is opened up a field for research at once broad enough to engage the attention of the brightest minds of this the most enlightened period of the world's history.

Much of the success attending the last year's institutes is due to local management of the county chairman. Wherever there exists farmer's organizations, the effect is at once seen in the attendance and interest taken. Hence, I earnestly recommend that the farmers everywhere in the State form themselves into an organization as a means of mutual improvement and protection to their interests. The State has dealt fair with our Division in the past years; however, the time, in our judgment, has come, when a larger appropriation should be made. The field is especially open for more schools of actual demonstration in dairying, fruit culture, soil tests, etc., all of which we are well assured will not be overlooked by the Legislature at its coming session.

Very respectfully submitted,

A. L. MARTIN,

Deputy Secretary and Director of Institutes.

REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, PA., *December 31, 1905.*

Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

DEAR SIR: In addition to the monthly reports presented to you regularly through the medium of the "Monthly Bulletin" issued from this office for the information of the people of the Commonwealth and others who may be interested in the advancement of the pure food cause, the following Annual Report, covering the year 1905, is respectfully submitted.

THE QUESTION OF CONSTITUTIONALITY OF LAW.

During the vigorous enforcement of the pure food laws, numerous obstacles, legal and otherwise, are constantly arising. The recent adverse decision of a county court in Western Pennsylvania revived an active interest in the important subject. Briefly summarized, the facts are as follows: In this case the defendant made a motion to quash the indictment. The motion contained seventeen reasons why the indictment should be quashed. These reasons resolve themselves into two propositions: First. That the act of June 26, 1895, is unconstitutional; and second, that the indictment does not charge the offense in words sufficient to inform the defendant of the crime for which he is to answer.

The Superior and Supreme Courts of Pennsylvania, as well as many common pleas judges have ruled in a number of trials in which the question of the constitutionality of the act was involved, that the act in question is constitutional and not in conflict with any of the articles of the State Constitution.

In the case of Commonwealth vs. Curry, 4 Sup. Ct. Pa. 356, Judge Orlandy delivered the following opinion:

"The title of this act, 'To provide against the adulteration of food, and providing for the enforcement thereof,' would naturally invite inspection by any one engaged in the manufacture or sale of food, and desirous of knowing what was to be avoided in the making and trafficking in the multiform food products of this day.

"The title does not tend to mislead, as it invites examination by the very words used, 'To provide against adulteration of food and providing for the enforcement thereof,' which reasonably embraces every food product, the different classes, kinds, modes of manufacture, and as it was a proper subject for legislative action, all persons, whether manufacturers or dealers, are attracted by the words of the title to a critical examination into the provisions of the bill.

"We do not agree with the reasoning of the learned judge below, and we think the title of this act fairly gives notice of the provisions of the act, so as reasonably to lead to an inquiry into the bill."

The assignments of error are sustained. The decree of the court below is reversed, and record remitted for further proceedings thereon.

Judge Orlady, in another opinion, also employed the following language:

"The purpose of the legislation in the passage of the act is most commendable and the State should favor a construction by the courts that will fully and effectually accomplish the subject of its enactment."

"The Superior Court of Pennsylvania in the case of Commonwealth vs. Kevin, 18 Sup. Ct. Pa. 414, sustains the Pure Food Act of June 26, 1895, and this decision is also affirmed by the Supreme Court in a lengthy opinion returned by Justice Mestrezat, as reported in 202 Pa. 23."

Commonwealth vs. Geesey, 1 Sup. Ct. Rept. 502.

"Hence if the defendant desires to attack the constitutionality of the act for reasons not heretofore raised, he must do so in a higher court."

The same question of constitutionality created by Judge Porter's decree has been met and considered by Judge Bell, of Blair county, and a number of judges of the courts of common pleas as already stated, who without exception have supported the decisions above quoted.

The decision of the Lawrence county court, while unfavorable so far as that county is concerned, has not interfered materially with the enforcement of the pure food legislation in other courts of the State.

SUPREME COURT DECISION IN ADULTERATED LIQUOR CASE.

In the Supreme Court of Pennsylvania, Justice Mitchell filed an opinion on May 24, 1905, in the case of Commonwealth vs. Kebort, appellant, reversing the Superior Court, and deciding that the act of Assembly commonly known as the "Pure Food Act," approved June 26, 1895, did not include liquor within its proper scope and meaning, and that the act, therefore, failed to create any such offense as was charged against the defendants, namely, "selling adulterated blackberry wine."

The Dairy and Food authorities had brought many prosecutions against dealers charged with the sale of spurious and drugged liquor of various kinds or brands, and a considerable amount was turned into the State Treasury on account of fines and costs collected and paid by such defendants. Of course, with the declaration of the highest court that the act under which these prosecutions were brought was defective and not applying to liquor, all proceedings came to an abrupt ending, and the Commissioner could not bring to trial the hundreds of unterminated cases, which were on dockets and in charge of magistrates, aldermen and justices of the peace in the counties of the Commonwealth.

A large number of the liquor cases had already been listed for trial in court, and these, too, were abandoned by the Commonwealth because of the untenable position of the Commissioner so far as the statute related to liquor.

Among the questions considered by the honorable court, was the following:

"Whether section 2 of the act could be sustained as to drink under the constitutional requirement that the subject of the act shall be clearly expressed in the title?"

The court declared that where such meaning is given to the words describing the subject of the act, and is not that which attaches to them in the common understanding, the Constitution requires that the title shall express such special meaning with at least sufficient fullness to put readers on inquiry as to its full provisions.

"Whether the crime with which the appellants were charged was anywhere made an offense in the statutes?"

The opinion of the court upon this point was to the effect, in substance, that sections 2 and 3 did not agree in their definitions as to scope and meaning, so far as "drink" and "food" was concerned.

The court says: "The act after bringing food and drink together under one definition, in section 2, returns in section 3 to the distinction commonly understood, makes full provision as to food as a separate subject, and then stops short, without any provision as to drink. It is apparent that the act either was left incomplete by its draughtsman, or the part relating to drink was cut out in its passage, and its place not supplied. Whatever be the reason, the act fails to create any such offense as appellants are charged with."

With the removal of this last barrier against the sale of impure and unwholesome liquor, earnest protests came from hundreds of persons from all over the Commonwealth, the majority urging that the needed bills to replace the defective legislation should be prepared and presented to the Legislature for consideration at the next regular session, and that such proposed acts should receive precedence. The press of Pennsylvania, ministerial associations, etc., united in appeals for corrective legislation, and many pastors selected the theme for stirring sermons.

The legitimate distiller and brewer, as well as dealer, is also in strong sympathy with the demand for unadulterated liquor. Their trade organizations and journals have spoken in unmistakable language, and, as already intimated in another part of this report, their demands will be heeded at the earliest possible opportunity.

REPEAL OF THE BORACIC ACID ACT OF 1903.

The repeal of the so-called "boracic acid law" of 1903, during the legislative session of 1905, has resulted in warm commendations from numerous scientific and medical experts, who freely declared that there was no good reason for its enactment. The subject of "doctoring" meat was not as fully understood, and as its abuse became too frequent, there was no alternative but to secure the repeal of the objectionable legislation. As to deleterious effects, Professor Wiley, Chief of the United States Bureau of Chemistry, who made exhaustive and far-reaching experiments, writes as follows:

"Results show that one-half grain borax per day is too much for the normal man to receive regularly. * * * Both boric acid and borax, when continually administered in small doses, for a long period, create disturbances of appetite, of digestion and of health."

To show the highly excessive amount of this preservative that might possibly be received into the human stomach at a single meal, Prof. Ladd, of North Dakota, reported as follows:

"In the meat, preserves and corn eaten at a single meal, a person might take as follows: Hamburger steak, 22.5 grains boric acid; canned corn, 16 grains; canned strawberries, 16 grains; total, 54.5 grains boric acid."

With fresh, cured and smoked meats more or less extensively dosed with boric acid, the call to repeal the objectional acts of Assembly could not have been otherwise than urgent, and the Legislature, therefore, saw fit and proper to promptly pass a remedial measure. As to borax; boracic, benzoic, salicylic acids, sulphites, saccharin, aniline and coal tar dyes, etc., their use is still too common, as an army of dyspeptics, nervous wrecks, suffering from stomach derangements and other diseases would fully attest if the truth were made clear. These drugs and chemicals cannot be otherwise regarded than a menace to the health of the strongest person, and those of weaker organisms through their continued use, disguised in food, must, necessarily, experience positively harmful effects.

PUBLICATION OF THE MONTHLY BULLETIN.

With the sole desire to aid in the curtailment of printing expenses, the "Monthly Bulletin" issued regularly from this office, is confined to the briefest possible condensation of the reports of the operations of the Division that will meet the demand of the law requiring its publication. While its résumé of the work done affords much thought for serious reflection, the introduction of editorial articles upon the subject of food adulterations and kindred subjects would aid very greatly in the education of the public.

The list of oleomargarine and renovated butter dealers who have complied with the Pennsylvania laws appears in each issue, and is revised monthly. If a firm or person engages in the sale of either or both of these commodities, and the name of such firm or dealer does not appear in the latest published number of the "Monthly Bulletin," it is safe to assume that the party has not complied with the law, and the Dairy and Food Commissioner, upon complaint, will not only promptly investigate the matter, but will regard the source of his information in strict confidence.

Numerous manufacturers and jobbers recently appealed to the Commissioner to have their addresses placed upon the regular mailing list for twenty-five or more copies, monthly, which they evidently intended to use for advertising purposes, but such requests cannot be complied with, owing to the limited edition which the law authorizes. So long as the quota is not exhausted, a single copy will be mailed monthly to every person interested in dairy and pure food subjects, upon application.

NEW LAW BULLETIN DISTRIBUTED.

As three important acts of Assembly relating to the work of the Dairy and Food Commissioner were passed by the Legislature of the present year, and met with the approval of Governor Pennypacker, it was deemed necessary to compile and publish a new

bulletin containing these and other statutes pertaining to dairy and pure food subjects. These bulletins are supplied free of charge to the thousands of firms and individuals who ask for information. A limited edition of the new laws was also printed in sheet form, for more general distribution amongst those specially interested. The Dairy and Food Commissioner believes in entire fairness toward all classes, and consequently made a special effort to inform those particularly interested in the new legislation as to its requirements, and the duties of those who were affected by the change in laws. Of course, the Commissioner could not be expected to offer full interpretations of such laws, as that part naturally devolves upon the manufacturer and dealers or their legal counsel, who are supposed to be entirely familiar with the component parts of the goods under inquiry.

THE PURE FOOD ACT OF 1895.

The Pure Food Act of June 26, 1895, with the exception of those parts referring to drink, has again successfully withstood the repeated attacks which were made upon it during the year now ending. A large majority of the food prosecutions ordered were charged upon violations of this statute. As intimated in another paragraph of this report, it is to be earnestly hoped that the members of the next regular session of the Legislature will still further strengthen the law, and make such amendments as past experiences will readily suggest. Unfavorable criticism and continued agitation is neither beneficial nor desirable.

NEW CHEMICAL LABORATORY ESTABLISHED.

Since the preceding annual report was issued, a well equipped chemical laboratory has been established in this city, for the use of the Department of Agriculture and its various sub-divisions. The work rendered for the Dairy and Food Division has been especially valuable and helpful, and with the constant increase and diversity of the work already assigned, its future usefulness and the magnitude of its importance can scarcely be overestimated.

The several chemists on regular duty, Professors Fuller and Loomis, are also making numerous special researches and original investigations into various matters pertaining to chemistry that will materially assist and expedite future work.

It is hardly necessary to state that the acquisition of these additional laboratory facilities is heartily appreciated by the officials of the Department of Agriculture.

CHEMICAL LABORATORIES NOT FOR PUBLIC USE.

There has been an entirely wrong conception in the minds of many food producers and distributors regarding the right or duty of the Dairy and Food Commissioner upon the question of analyzing samples that might be submitted by them, and, consequently, issuing for their commercial use, certificates of purity. This system would work incalculable harm, even if it were practicable, since it has been repeatedly proven that many producers change formulas to suit their own interests and local conditions, or to meet competition, as circumstances may prompt. It is also known that apparently

the same brand and package of some goods are sold in adjoining states which contained goods of a decidedly different grade or quality because of the variance in the pure food laws in force in the respective states. In view of these indisputable facts, the system of advertising food products proposed by certain persistent correspondents, who continue to demand free analytical examinations and certificates of purity, would fall into bad repute very speedily because of its self-manifest impropriety and actual wrong. In addition to the above objection may be cited the fact that the Commonwealth does not provide the needed laboratory facilities nor funds for making such analyses for manufacturers, jobbers, retailers or private individuals. If the precedent were established, there is no doubt that the several laboratories would speedily be flooded with all kinds of samples, and that as a result, it would render all efforts to perform the proper and legitimate work of the Division not only futile, but an actual farce.

If manufacturers produce pure goods, they are already fully informed of the self-evident truth that they can offer for sale or sell the same in any state without fear of any interference or molestation on the part of pure food officials. On the other hand, if the peculiar composition of their products is such that they have any reasonable doubt or fear as to the legality of their sale and use, their duty, as it appears to the Commissioner, is to consult their own attorney and chemist. The Commissioner will, however, upon request, cheerfully supply all those interested with a pamphlet containing the dairy and food laws, free of charge, together with such other information as he may deem proper.

This explanation at this time is rendered necessary because of the large number of correspondents who seek information upon the subject discussed.

PROSECUTIONS REPORTED IN THE BULLETIN.

An examination of the reports of terminated food prosecutions which appear regularly in the columns of the "Monthly Bulletin" show that a very large proportion of the suits brought are ended by the payment of the fines and costs, without appeal to the regular channels of justice instituted by our government for proving such questions. This, probably, is due to the fact that a case at trial would be likely to result not only in a conviction, but the imposition of additional costs. The Commissioner does not ignore the fact that the most sacred thing under our form of government is the right of the individual citizen to his good name, and if he chooses to defend his position in open court, it is his natural right. On the other hand, where the alleged violation of law is firmly established, and the manufacturer or retailer desires to plead guilty and pay the fine and costs, ordinarily, there appears no good reason for a refusal, and magistrates, aldermen and justices of the peace should be granted jurisdiction and proper authority to terminate such suits.

The work of the Dairy and Food Division, so far as the same lies within the discretion and power of the Commissioner, will not permit any unfairness. The deep sense of justice due to the individual citizen of the Commonwealth, is always carefully regarded and never purposely ignored in the consideration of violations of the laws.

PROSECUTIONS DURING 1905.

The reports of the official chemists confirm the statement advanced in the preceding annual report that the percentage of adulterated, preserved, counterfeit or impure articles of food, and milk in particular, is gradually growing very much smaller. As a result, the number of prosecutions ordered during 1905 again shows a marked decrease, as compared with the preceding year. The total number of suits ordered by the Commissioner are presented in the following summary:

1903,	1,800
1904,	1,517
1905,	1,085
	<hr/>
	4,402
	<hr/>

The decreasing figures form their own commentary. The continued violation of the oleomargarine law was productive of the next to the largest number of suits ordered in 1905, namely, 187 in number, while 30 defendants were charged with violating the renovated butter law. The sale of chemically preserved meat, sausage, etc., resulted in the ordering of over 200 prosecutions. Jellies, jams and preserves were found illegal in 144 cases, while Maraschino cherries produced 53 unfavorable chemists' reports. Eighty-three samples of catsup were found to be illegal, while prosecutions were directed against 52 dealers who sold Worcestershire and other sauces containing forbidden chemicals. In strange contrast with previous reports, only 47 samples of milk and cream proved unlawful.

Candy was examined more carefully than ever before, and 62 adulterated samples found. The quality of spices continued to improve, only 25 adulterated brands being reported by the chemists. Other articles of a miscellaneous character supplied the remaining suits.

HOW CASES ARE CONSIDERED.

The Commissioner desires to state that all evidence surrounding possible cases for prosecution always receives careful and conscientious consideration. The large percentage of convictions secured verifies the above statement, since it is of rare occurrence that a suit falls. The samples purchased for analytical examination are invariably bought by a sworn special agent, but all of them have been instructed to do absolutely nothing that might be construed as unfair towards dealers or to induce or tempt them to commit violations of the laws. As already explained, a prosecution is only based upon an actual sale to a sworn special agent of the Dairy and Food Division. The substitution of oleomargarine when butter is asked for, forms a violation of law that usually results in an easy and early conviction, since neither magistrates or courts are in sympathy with such practices.

COURT TRIALS STRONGLY CONTESTED.

With the acquisition of increased experience, many of the court cases are more strongly contested than ever before, and, as a

result, the expenses of the Dairy and Food Division increased in a proportionate degree. Legal and scientific technicalities, diversified opinions of courts, varying interpretations of laws, etc., all of which make the work of the Commissioner more trying, exacting and costly.

The Commissioner appreciates the constant courtesy, co-operation and good will of the honorable Secretary of Agriculture, and is also deeply grateful to all who assisted in making the past year's record notable and satisfactory and a distinct advance in the cause. No other State in the Union can claim greater results.

THE DIVISION A REVENUE PRODUCER.

Contrary to expectations, the continued vigorous enforcement of the dairy and food laws has again been an actual source of revenue for the Commonwealth, the total receipts of the office slightly exceeding the expenses of conducting the same, notwithstanding the increased expenditures for chemists and laboratory expenses, attorneys' salaries and fees, expert witnesses' testimony, extra detective work and the regular field work of the special agents. The Commissioner and his assistant also constantly kept in close touch with the work outside of the office, very frequently visiting the various parts of the State to personally observe where improvements in conditions for the good of the service might be secured.

As the financial statement shows, there was a considerable decrease in receipts as compared with the preceding year, because of the greater percentage of purity of food commodities analyzed, and it is believed that the coming year will show a still further shrinkage.

FINANCIAL STATEMENT FOR 1905.

The appended detailed financial report of the receipts of the Dairy and Food Division for the year ending December 31, 1905, is respectfully submitted. The amount of licenses fees, pure food fines, etc., deposited in the State Treasury both prior to and after June 1, 1905, are kept separate, as under the provisions of the General Appropriation Act of 1905, the receipts of the office could no longer be applied to the payment of current expenses incurred in enforcing the statutes, but such expenses were provided for and paid through an appropriation made by the Legislature. That a large balance remaining on hand, after the settlement of all claims for services, expenses, etc., incurred previous to June 1st, reverted to the Commonwealth of Pennsylvania, is a matter deserving of note. Notwithstanding the great expense of enforcing certain dairy and food laws, no less than \$76,718.74 was turned into the State Treasury in compliance with law, after the settlements of accounts for services and expenses arranged for and incurred previous to the approval of the new act.

The receipts of the office during 1905 aggregated \$82,467.60, for which amount receipts were issued by the State Treasurer.

RECEIPTS OF THE DAIRY AND FOOD DIVISION, 1905.

PURE FOOD FINES.

January 1st to June 1st,	\$8,363 16	
June 1st to December 31st, inclusive,	25,051 30	\$33,414 46

OLEOMARGARINE.

License.

January 1st to June 1st,	25,906 52	
June 1st to December 31st, inclusive,	916 71	26,823 23

RENOVATED BUTTER.

License.

January 1st to June 1st,	4,700 03	
June 1st to December 31st, inclusive,	100 00	4,800 03

OLEOMARGARINE.

Fines.

January 1st to June 1st,	5,105 76	
June 1st to December 31st, inclusive,	5,785 22	10,890 98

RENOVATED BUTTER.

Fines.

January 1st to June 1st,	842 84	
June 1st to December 31st, inclusive,	540 30	1,383 14

MILK FINES.

January 1st to June 1st,	526 31	
June 1st to December 31st, inclusive,	1,446 37	1,972 68

MEAT FINES.

June 1st to December 31st, inclusive,	3,183 08	3,183 08
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\$82,467 60

FINANCIAL STATEMENT 1901 TO 1905, INCLUSIVE.

In conformity with previous custom, the following comparative financial statement for the years 1901 to 1905, inclusive, is hereby presented for your examination. A careful analysis of the figures is earnestly requested, since these briefly indicate the extent and scope of the work of the Dairy and Food Division more fully than the ordinary routine reports.

TOTAL AMOUNT PAID INTO THE STATE TREASURY.

	1901.	1902.	1903.	1904.	1905.
Pure food fines,	\$4,833 23	\$8,082 20	\$39,752 18	\$53,904 05	\$33,414 46
Oleomargarine license fees, act 1899,	20,516 74				
Milk fines, act 1901,	225 00	1,177 24	6,093 56	1,685 00	1,972 68
Oleomargarine license fees, act 1901,	1,089 26	23,927 05	37,911 18	31,277 61	26,823 23
Oleomargarine fines, act 1899,	5,446 97	3,238 18	616 20	85 00	
Oleomargarine fines, act 1901,	2,070 87	5,225 75	5,907 28	2,098 22	10,890 98
Oleomargarine fines, act 1893,			125 00	100 00	
Renovated butter fines, act 1899,	120 00	5 90	17 37		
Renovated butter fines, act 1901,		572 68	1,632 05	2,321 56	1,383 14
Renovated butter licenses,	175 00	766 67	266 67	4,042 09	4,800 03
Cheese fines,	165 00	169 50			
Vinegar fines,	73 12	447 24	779 34		
Lard fines,		23 00	357 00		
Preservative fines, act 1903,				669 70	
Meat fines, act 1905,					3,183 08
	\$34,705 19	\$43,635 41	\$93,458 71	\$96,183 23	\$82,467 60

NEED FOR A NATIONAL PURE FOOD LAW.

President Roosevelt in his message to Congress, briefly but strongly endorsed a National law to govern inter-state commerce in foods, recognizing its importance and necessity. Strong interests are again opposed to the enactment of any good and effective legislation upon this question, and at the present writing the prospect for the much needed law is not very encouraging.

There is a multiplicity of bills; radical differences prevail in various directions; interests of diverse opinions are aroused and, in general, the outlook is not as encouraging and satisfactory as had been hoped. That there should be any serious objections to guarding the health of the people, and also to preventing them from being defrauded by the substitution of counterfeit or inferior products when they are charged full value is, indeed, surprisingly strange. With the revision of the Federal statutes, the work of the Dairy and Food officials in the various states of the Union would not only be simplified, but accelerated, and still greater benefits for consumers would inevitably follow the joint work of the State and Federal authorities. Pennsylvania, with its population of seven millions and vast manufacturing and agricultural interests, has been deeply stirred and thoroughly aroused, and it is earnestly to be hoped and wished that Congress will strengthen and aid in the good work. This is a question in which all are directly concerned. The measure has our hearty approval.

CORRECT LABELLING OF FOOD PRODUCTS.

The subject of the proper and correct labelling of food products is a question that is inevitably reappearing with due regularity in the voluminous correspondence of the Dairy and Food Division. The subject was discussed with more or less force in a preceding report.

The Commissioner does not approve of the argument advanced by some manufacturers and dealers that if the label explains the story of the ingredients, the law has been complied with. This fact has been demonstrated in many prosecutions, and it is well to take proper precautions. Vilely concocted and injurious articles

of food which are only too frequently used in nearly every household, have no legal rights, and the mere labelling would guarantee no immunity against prosecution.

Pure goods properly labelled, have a legal status in every state, and the Commonwealth will not be arbitrary, nor too technical or scientific in its definitions of what constitutes an illegal adulteration; but, as already intimated, base and illegal compounds will not be tolerated if discovered in the markets of Pennsylvania. The legitimate manufacturer usually deprecates the sale and use of any questionable food commodity, and advocates an honest label; one which gives all who may be concerned a correct and fair idea of the true character of the food product offered, and leaving the purchase and use of the article itself to the discretion and judgment of the possible patron.

EFFECTS OF HARMFUL FOOD ADULTERANTS.

In order to practically demonstrate the harmfulness of certain chemicals and food preservatives which are in common use, the Inter-National Stewards' Association, through its official chemist, Prof. Eugene Gerard, experimented upon various animals, with the following results: Two shoats were fed exactly at the same time and under the same conditions, except that the food of one was pure and that of the other contained some of the added coloring matter contained in many articles of food. They started the same, but in a short period of time the pig eating artificially colored feed weighed only 85 pounds, as compared with the other weighing 145 pounds.

Two dogs received similar treatment, excepting that in the one case, coloring matter and chemical preservatives were included in his dietary, the same as are to be found in many articles prepared for human consumption. The dog fed pure food is well and abnormally fat, while the other is a perfect type of a dyspeptic in general appearance and scarcely able to exist. The same results were produced with similar experiments upon other animals, thus again proving that artificial colors and chemical preservatives are harmful. Since they offer no value in compensation, Prof. Gerard very properly demands to know why the American people should continue to take the risk of imperiling health and life by permitting their use.

At a recent exhibition of dogs which had been subjected to the experimentation above described, the agents for the Society for the Prevention of Cruelty to Animals threatened to interfere because of their pitiable condition produced by the impure foods; but as the demonstration was intended purely for the education and good of the public, generally, no arrests were made.

SALE OF MAPLE SYRUP.

The analyses of many samples of maple syrup made during the past year proves that illegal brands are fast becoming a rarity. While it is a fact that certain firms continue in business, their former arrogance no longer prevails. The imitation or adulterated syrups produced by them are now being sold for what they are, rather than under fancy, misleading labels, decorated with maple leaves, etc. This change is praiseworthy.

The high price of maple products may have stimulated the manufacture and sale of artificial syrups and sugar from cane sugar and glucose, but this fact would not justify the sale of the counterfeit substitute at the prevailing high price of the pure maple sap product, nor for the purpose of concealing inferiority.

The chemist has no difficulty in determining the composition of maple syrups or sugar, contrary to the opinion expressed a few years ago, and present methods of analysis, based on the quantity of ash, volume of precipitate with lead subacetate, alkalinity of ash and other data, now afford information that cannot be doubted or questioned. As already intimated, the general quality of these maple products has reached an unequaled percentage of purity, and, as a result, the legitimate trade has been benefited in a corresponding degree. There are adulterated or compound syrups remaining on the markets, which command prices that almost reach the level of those of the pure maple products, but the matter is beyond the control of the Commissioner. The remedy depends solely upon the purchaser and consumer.

CANNED GOODS OF A HIGHER STANDARD.

In the Annual Report for the preceding year, reference was made to the demand on the part of the best trade and consumer for a better and higher grade of canned fruits and vegetables. The canning industry of the United States recognizes this demand as never before. The pure and impure brands are becoming better known to the trade, and the lines are being more clearly defined. The reputable firm has no desire to have a reputation blasted nor to squander a fortune in defense of charges of adulteration or chemically preserving their canned products. The "dope" producer has also learned a practical lesson.

The canning industry is vast in its resources and capital, and the Dairy and Food Commissioner is glad to offer this grateful acknowledgment for the recognition given to the public demand for a higher and better class of goods. The trend is plain and most encouraging, and just as soon as the public also realizes that quality rather than quantity, is a desirable desideratum, some additional evils will be eliminated.

The pure food issue is a live one, commercial fraud is decreasing, and reputable packers of canned goods now hesitate long and seriously before they are willing to cut quality in order to meet competition. The question of labelling canned goods, so as to show the year in which they were grown and packed, has many advocates, but up to the present time no definite line of action has been determined.

CHEMICALLY PRESERVED OYSTERS.

Reports reaching the Dairy and Food Division that certain oyster dealers were using chemical preservatives both to keep and restore opened oysters of questionable quality, an investigation was at once instituted. The special agents of the Division purchased samples from nearly 500 dealers, with the result that a number were found upon analysis to contain boracic acid and other chemical preservatives. It was a singular coincidence that in some counties of

the Commonwealth all the samples were free from preservatives, while in other localities the practice appeared to be almost a common one. As already stated, a number of dealers were prosecuted, and the suits settled upon the payment of a fine and costs.

In one county the law failed of its purpose and intent, because the press vigorously defended the local defendants, declaring that the oyster packers residing in another state were the real offenders at fault and that the home dealers had no guilty knowledge of the drugging of the oysters which they were selling and peddling to an unsuspecting patronage. The argument, while fallacious and misleading, had its desired effect and resulted in the acquittal of the accused defendants. As the packers are non-residents of Pennsylvania they are congratulating themselves upon the miscarriage of justice.

SACCHARIN DECLARED A FRAUD.

The "American Grocer," published in New York, in an interesting editorial pronounces saccharin a fraud, in substance as named and in use. Dr. Wiley, of the National Bureau of Chemistry, also declares it "a deception and that the person who invented it meant to deceive, because saccharin is a word which means something else altogether." He states that it was simple robbery to take a word in the English language which meant one thing and to apply it to something which it does not mean at all.

Saccharin is substituted for cane sugar, because it is said to be five hundred times sweeter than sugar. In other words, one authority printed a statement to the effect that \$500.00 worth of saccharin would take the place of \$10,000.00 worth of cane sugar. If this declaration were sustained in part only, its capabilities for gain in the hands of unscrupulous manufacturers would be almost incomprehensible.

As a coal tar derivative, it is but natural to assume that it is indigestible and that its constant or frequent use could not fail to create disturbances of the digestive organs, and thus injure the human system.

The canning trade, manufacturers of soft drinks and others have been discovered using this illegal article in food and drink, and, as a result, arrests were made and the usual penalties imposed. If the medical practitioner sees proper to prescribe saccharin in the treatment of certain ailments, it may be within his proper scope and discretion, but the article has no valid place in the daily dietary of the citizens of Pennsylvania.

The "American Grocer" very properly urges that every tin of food containing this coal-tar product be labeled "Sweetened with Benzoic Sulphinide." This plan while entirely prohibiting the sale of such goods in this State, since its use was at once shown, would only be fair to the consumers of other states, and a due measure of credit and justice to the packers and producers who eschew its use because of its questionable character.

FRUIT SYRUPS AND SODA WATERS.

The continued agitation of the question affecting the purity of fruit syrups and the consequent prosecutions ordered against dis-

persers of soda water in numerous parts of Pennsylvania, resulted in the enactment of a special law bearing upon the subject. The first section of the new statute reads as follows:

“That any person, firm or corporate body who shall by himself, herself or themselves, or by his, her or their agents or servants, manufacture, sell, ship, consign, offer for sale or expose for sale, or have in possession with intent to sell, any fruit syrup which contains formaldehyde, sulphurous acid or salicylates, dulcin, glucin, beta-naphthol, abrastol, asaprol, fluo-rides, fluoborates, fluosilicates or other fluorine compounds; also any coal-tar dyes, sulphate of copper, or any other coloring matter injurious to health, or any preservatives or their compounds injurious to health, shall be deemed guilty of a misdemeanor.”

It is pleasant to report that there is a more general disposition to observe the law than ever before, as is evidenced by the decreased number of suits, the chemists' analytical reports fully substantiating the claim of increased purity in fruit syrups.

The curb-stone dealer in so-called “soda water” and other soft drinks of questionable composition continues in evidence, but on account of mistaken sympathy, they are too frequently permitted to escape the clutches of the law. This class of offenders will receive a better knowledge of their responsibilities if the traffic in harmful drinks is not stopped. Their pernicious influence is especially bad, since children are the principal patrons of such venders and the smaller shops.

NATURAL ACIDS FOUND IN FRUITS.

Both theory and practice have been advanced on the part of some manufacturers for justifying and excusing the use of chemical preservatives in preserved fruit, etc. These manufacturers went so far as to proclaim to the world that nature was supplying preservatives, namely, salicylic acid and benzoic acid in certain fruits in considerable quantities, and that, consequently, there was a valid reason for continuing the practice, though on an enlarged scale.

During the past year, several of the chemists employed in the laboratories of the Dairy and Food Division, made careful researches into the subject, grapes, berries, including cranberries and other fruit, being subjected to the most careful analytical test for the discovery of the aforesaid acids. While it is true that benzoic acid was located in some fruit, its quantity in all cases was almost infinitesimally small. This small amount was further decimated or slightly augmented by the condition of matured or ripened fruit, and the experiments made were consequently of special value since they clearly proved that added benzoic and salicylic acid were readily determinable quantities, and that they had no natural right in such manufactured products. The legal status needs no comment, since the courts of the Commonwealth have repeatedly confirmed the attitude of the Commissioner. The experiments will be continued, but there is no indication that the present views upon the use of preservatives need be modified. In other

words, the preservative introduced by nature into fruit is of such a small quantity that the practical food chemist can readily afford to ignore its existence, and will only include and consider the added amounts in his official reports or in recommendations upon the advisability of starting suits.

USE OF SULPHITES PROHIBITED.

The use of sulphurous acid and the sodium salt, sodium sulphites as preservatives of meats, canned and dried fruits and vegetables, and also in beverages such as beer, etc., is absolutely prohibited by the laws of Pennsylvania. The sulphites are most commonly found in fresh or uncured meats, being employed in preserving and brightening, or to restore their natural color. In this Commonwealth, sulphites were most frequent in Hamburger steak, sausages, etc., as the docket records show that a considerable number of dealers were arrested and fined because of its unwarranted use. A number of these defendants pleaded that the preservative had been sold to them through false claims as to the virtues of the composition. The experiments of noted chemists, physicians and others all show that such preservatives not only mask decomposition, but that when administered even in small doses, they produce marked and unfavorable physiological effects. This in the main, was the opinion of many experts who were called upon to testify in connection with prosecutions brought in behalf of the Commonwealth through the Dairy and Food Commissioner. If the consumption of such antiseptics by those in good health, through the medium of food, is declared harmful, it is difficult to estimate the harm wrought when invalids are dosed, and the nutritive elements of their food are correspondingly diminished.

The most valuable asset of the human being is health and strength, and this supreme blessing should not be trifled with or destroyed by the debilitating influences consequent to the unwarrantable custom of adulterating or chemically preserving leading articles of food. The people deserve and are perfectly entitled to protection and the continued heritage of good health, so long as beneficent laws can be made available.

CONFECTIONERS DEMAND PURE GOODS.

Although the National Confectioners' Association of the United States and a number of State organizations, comprising in its membership the leading wholesale candy manufacturing trade of the country, have strongly and repeatedly declared for the absolute prevention of the harmful adulteration of confectionery, it was found that many objectionable goods were still upon our market, although, in general, the confectionery sold is of a vastly higher grade of purity than ever before. The use of terra alba, barytes, talc, chrome yellow or other mineral substances or poisonous colors or flavors or ingredients deleterious or detrimental to health is positively illegal.

During the year just closed, numerous vague but alarming reports of candy poisoning reached the Commissioner. In some instances samples of candy accompanied such complaints. Upon careful ex-

amination, it was found that the cause of the illness could not always properly have been ascribed to the candy, but that it must have been produced by other causes, unless it was consumed in excessive amounts.

ADULTERATED CANDY PROHIBITED.

The examination made of many kinds of confectionery revealed the existence of a state of affairs that warranted scores of prosecutions, because of the indiscriminate use of organic and mineral coloring matter, grease, copper and other adulterants. The goods in a number of instances were misbranded or misrepresented; for example, certain so-called chocolate confections did not contain a particle of chocolate, etc. It was not always a question of price, as misrepresentations were discovered in both the cheap and high grade candies. As some of the chocolate substitutes were pronounced harmful to health, being of a mineral composition, and, consequently, indigestible, the chemists recommended prosecutions. That the movement was popular with both the courts and public, the newspaper comments and editorials will clearly prove.

The use of colored glucose in supplying the demands of confectioners is assuming very large proportions, despite the fact that at best it can only be regarded as a cheap, but clever impersonator of sugar. It is but proper to add, that the leading trade organizations representing the immense confectionery interests of the United States, as well as prominent manufacturing firms, are in sympathy with the pure food laws, and will not encourage or countenance fraudulent or unfair practices. Physicians and chemists declare that many children are made ill through dosing their stomachs with cheap substitutes and adulterated candy, and that the sale of such goods should be stopped. Sulphur-dioxide is also under the ban.

It is probable that the subject will receive merited attention during the coming year. The confectionery business has assumed immense proportions, and if the sale of harmful products were permitted, a serious wrong would be inflicted upon the public, who not only demand pure candy, but are willing to pay proper prices for such.

ADULTERATED JELLIES.

The manufacture of fruit preserves, jams, jellies, etc., apparently offered a specially inviting field to some unscrupulous persons with the passing away of the olden-time methods of preserving fruits in the home kitchen, and the consequent advance in the standard of living and general conditions. The manufacturer of such goods soon entered upon a large and profitable trade. Eventually cheapness and inferiority were the sole ambition of some producers, in order that they might not only meet increased competition, but realize a higher percentage of gain. As a result, the consumer must be taught to know that he is likely to be deceived, and that the goods he buys may contain harmful adulterants, besides being a compound article entirely devoid of the fruit after which it was named.

During the year just ended, hundreds of samples of jellies, etc., were analyzed by the chemists of the Dairy and Food Commissioner,

and it is a pleasure to state to the public, that, comparatively speaking, the results attained show a marked change for the better.

The Commissioner was obliged to institute legal proceedings against a number of dealers who sold brands which were not only counterfeit productions, devoid of the fruit after which it was named, but preserved with chemicals and highly colored with coal-tar dyes. The story of raspberry and strawberry jams made from apples, glucose, and coal-tar dyes, with timothy seed added to imitate the seed of the true berry, was again exemplified in connection with the examinations made a year ago, but so far as is known, these brands are no longer to be found in the markets of Pennsylvania. It is also fully understood that the label even if truthful and exact, could not legalize the sale of any goods, when adulterated, spurious, colored and drugged. The plea that the people in moderate circumstances really want goods of the illegal character and bad quality described, is not sustained by actual facts.

COMPOUND LARD MUST BE LABELLED.

One of the peculiarities of the year's results was a revelation of the fact that compound lard was no longer freely imposed upon the public as the pure fat of swine, and that consumers were usually informed as to the nature of their purchases by the labelling of the package with the words "Compound Lard" as required by law.

Lard containing beef fats or stearine and cotton seed oil can be sold under the provisions of the act regulating the manufacture and sale of "Compound Lard," approved June 18, 1901, but if offered for sale or sold as genuine, pure lard, the seller is subject to a fine not exceeding fifty dollars for the first or one hundred dollars for any subsequent offense. The law requiring the labelling of compound lard will be rigidly enforced, and grocers, generally, will do well to duly observe all of the provisions of the above cited act. The special agents have been instructed to watch such sales closely.

FRAUDULENT TRANSACTIONS IN COFFEE.

A peculiarity of the immense coffee trade has been brought to the attention of the Commissioner by correspondents who complained of the extreme variations in quality, strength and value of the so-called "Java and Mocha" blends of coffee, which are being sold so freely. While the signs seen in some stores offering "Genuine Java and Mocha" coffee at prices ranging from 12½ to 20 cents per pound, may be positively misleading, the unscrupulous dealer in the high grade coffees has the greatest opportunity for gain, and there is no doubt, whatever, as to the truth of the declaration that the coffees of Arabia and Dutch Java Islands are called upon to bear many burdens of misrepresentation and misinterpretation as to quantity and quality of production. With the vast possibilities for coining money in the manner indicated, it is also pleasing to add, that there are many first class firms and dealers who decry such practices, and cater to trade with every honorable ambition to win and retain trade by a strictly legitimate business.

SALE OF DISEASED MEAT.

The sale of alleged diseased meat has been brought to the attention of the Dairy and Food officials upon at least several occasions.

These complaints averred that such sales were made knowingly and wilfully by butchers and others who were unwilling to bear a financial loss because of the discovery after the animals were killed, that they were tuberculous. In the aforesaid cases, unfortunately, the complaints were ineffectual because all of the meat had already been disposed of, and it was no longer possible to secure proper legal evidence to secure a conviction in a jury trial. The subject is one that strictly and properly comes under the jurisdiction of the State Live Stock Sanitary Board, but the Dairy and Food officials are always willing to co-operate whenever the interests of the public can be best conserved.

A published statement refers to the fact that in Europe, one-third of the animals killed for human food suffer from tuberculosis, which is communicable to man, and the fact that there are 37 per cent. less deaths from consumption among Jews than Christians is presumed to be entirely due to the precautions taken by Jews in their more rigid and thorough system of meat inspection.

If this repulsive tuberculous meat is injurious to health, it should not be sold for human use at any time or under any circumstances. It is not necessary to prove that actual injury to health has already been done, but it is sufficient to know that it is capable or likely to cause such injury to the unsuspecting consumer.

It is worthy of special note that the percentage of diseased cattle and swine in the United States is far less than that of Europe, and that the general conditions are regarded as vastly better.

CEREAL BREAKFAST FOODS.

The remarkable increase in the sale of the numerous brands of so-called cereal breakfast foods, has caused many inquiries from correspondents as to their actual value as a food, digestive qualities, etc. These almost numberless varieties of food are sold at greatly varying prices, and when the fortunes that are expended in advertising such products are taken into consideration, it is plain that the consumer is paying a proportionately high rate for the food value which he receives in return for his money.

These cereal foods are said to be easily divided into three distinct kinds, to wit: First. Those which are usually prepared by simply grinding or crushing the decorticated grain. Second. Those which include the products of grains which have been steamed, partially cooked, etc., and then ground or rolled. Third. Those brands from which a considerable part of the starch has been removed, or undergone a chemical change by the action of barley malt. These malted preparations are especially popular, because of the fact that a portion of the starch has been converted into a more soluble form.

The observations made indicate that labels are not always entirely truthful; that some manufacturers make extravagant claims as to nutritive forces and digestibility, and that the cost in some instances is rather excessive. All of these several questions must be answered in the same general way; individual peculiarities will prevail, and after satisfying the sense of taste, you will readily select the food that for a given sum will supply the largest amount of digestible nutrients in a palatable form.

As no deleterious adulterations were discovered by chemical examinations, and the housewife still approves of their use, the Dairy and Food Commissioner has no further comments to make. The industry has assumed gigantic proportions, and the public demand is constantly increasing as the number and variety of new brands amply proves.

LABELLING ADULTERATED FOOD PRODUCTS.

Apropos to the interesting subject of the labelling of adulterated, imitation and colored and chemically preserved foods, it is right and proper to explain that no label, no matter how complete in its details, would exonerate the manufacturer or seller from legal responsibility, should an article upon analysis be found illegal. Scores of correspondents have taken the position that if a label on a package told the truth, there could not be any valid foundation for a suit. In numerous cases, the labelling on packages read as follows: "Artificial coloring and antiseptic used." As the published reports of terminated suits will show, the courts invariably imposed the usual fine and costs. The labelling of imitation jellies and jams also reveals the ingenuity of a certain class of manufacturers who cater to the cheapest trade. So-called plum, strawberry, grape and other fruit jellies very often do not contain a particle of fruit excepting apple juice which forms the base of the compound. This is flavored with some synthetical compound and preserved with as much as 60 per cent. corn syrup. Very often a small, obscure label will read: "Colored; preserved with benzoic acid," or "Antiseptic is used, also small amount of coloring." By a queer method of deduction, the same illegal goods may occasionally be found to bear the additional assurance, "We guarantee the purity of the contents of this package." The fact that the label may even go as far as to state that "these goods were made and branded to conform to the Pure Food Laws of Pennsylvania," does not exonerate the seller from responsibility. Goods bearing compound labels should be carefully scrutinized by dealers, and if in doubt, only bought and sold under a proper guarantee from the manufacturer or jobber. The Pennsylvania laws do not approve of fraud or imposition under any conditions.

USE OF FICTITIOUS FIRM NAMES.

One of the developments incident to enforcing the pure food laws, is the revelation of the fact that a law should be enacted which would make it prohibitory to sell any food product which does not bear the correct name and address of the manufacturer, or which is sold under a fictitious name and address. In a few instances such mislabeled goods came to the attention of the officials of Pennsylvania, while it is said that in other states where the laws are less rigidly enforced, the practice is a more common and growing one. It is needless to add that such brands are almost invariably found to be adulterated or illegal, and if the local merchant is fined for their sale, he usually experiences considerable trouble before he can recover the fines, unless the goods were purchased direct from the home jobber or wholesaler under a guarantee. Reliable firms and the packers of pure goods are never ashamed to have their name and address appear upon the goods sold by them.

NEED FOR PRACTICAL FOOD EXHIBITS.

Because of the increased and pronounced public interest in pure food supplies and the food shows which are being held in the large cities by various organizations, the Dairy and Food officials of Pennsylvania have been requested to prepare for display at such shows, an exhibit or collection of exhibits showing the form and manner of food adulterations and fraudulent or counterfeit productions, together with full particulars. The display, if arranged, might go even further, and show as far as practicable, the nutritive values of food. Adulterated dairy and food products, if properly classified, together with an exhibit of pure goods, could be so displayed as to prove an almost invaluable source of information and education.

While labor and expense would be necessary, it is certain that the time and money would be well spent, if such a display were assembled in the offices of the Commissioner, and also for use at pure food shows. A representative of the Commissioner could at a trifling cost, if deemed necessary, attend such shows and explain the exhibits to the public. There is ample excellent material for a display available.

SALE OF IMMATURE OR "BOB-VEAL."

Because of questionable or doubtful phraseology in formulating an act to prevent the killing for food purposes of calves under four weeks old, His Excellency, Governor Pennypacker, vetoed an act relating to this important subject which was passed by the Legislature of 1905. This necessity for Executive interference with the proposed act is sincerely regretted as the trade in "bob-veal" or "monkey-veal" in Pennsylvania has assumed very large proportions. There is but a single compensating feature manifest, which is in the fact that but very little of the immature veal is sold to the consumers of Pennsylvania, directly, but is shipped to the larger cities outside of the Commonwealth.

It is unfortunately true, however, that some of the deleterious meats are canned and reshipped into the State in the guise of various high-sounding names entirely foreign to "monkey-veal" and at correspondingly high prices. The epicurean is, therefore, as in past years, not always positive or certain as to the origin or ancestry of the potted canvas-back duck, turkey and chicken which may be displayed before him in the most tempting manner. The Commissioner has co-operated with the health authorities of several adjoining states in his endeavor to suppress the nefarious traffic, but, as shipments are usually made in bales and boxes, or clandestinely, if possible, the results desired are difficult to reach. The subject will no doubt receive further legislative consideration at the next session.

ADVOCATING NEW LIQUOR LEGISLATION.

As the adverse decision of the Supreme Court of Pennsylvania, to which reference is made on another page of this report, practically ended the prosecution of dealers who sold spurious, harmful and deleterious liquor, it is reasonably fair to assume that the betterment of conditions which was produced by the hundreds of prosecutions, has been nullified either wholly or in part. This is the consensus of opinion as expressed by the reputable members of the trade. They refer even more markedly to the immense ad-

vance in the standard which prevailed up to the time when the unfavorable edict was issued, and earnestly hope that the next Legislature will enact stronger, better and more far-reaching laws to stop the objectionable traffic.

It is also declared that there is a distinct improvement as regards drinking habits. This may be due to the fact that restaurants and hotels are more than ever havens of rest and sociability, and partially to the additional fact that the moderate drinker has a wholesome fear of drugged, counterfeited and deleterious alcoholic drinks. The standard of nearly all public resorts has unquestionably been raised, and home-life is also being appreciated more fully. The first-class drinking resorts are not lacking in point of attractions and liberal patronage, but, as already stated, the improvement in conditions is self-conspicuous.

THE PATENT MEDICINE PROBLEM.

A notable feature of the year was the extraordinary attention which the press accorded to the pure food question and exposé of the alleged "patent medicine" frauds. Leading magazines and journals teemed with highly interesting and somewhat sensational accounts of how people were being imposed upon or poisoned by these subtle poisons, whether introduced into the human system through the medium of adulterated food products, or so-called "patent medicines." The same journals cited examples of cases where patients created enslaving appetites for alcohol through the protracted use of certain so-called "medicines," and referred to the fact that a number of Southern papers were already advertising cures or remedies for counteracting the evil done by medicines which contained excessive amounts of alcohol. The charge is made that because of an almost criminal alliance of some newspapers with fraud and poison, on account of liberal advertising patronage at high rates, these poisons and nostrums reach the thinking classes, as well as those who are, perhaps, more readily gulled.

PATENT MEDICINES TO BE LICENSED.

This office received numerous letters from anxious correspondents who desired information relative to an order issued by the Commissioner of Internal Revenue of the United States, requiring druggists and dealers generally who sold a certain class of patent medicines to pay a revenue tax as liquor dealers. The official order was issued by the United States authorities, and local revenue collectors are empowered to supply information and take the action that may be necessary to enforce the edict.

Correspondents were promptly advised of the fact that the Dairy and Food Commissioner had no jurisdiction in the matter.

These so-called patent medicines, although enjoying a large sale, in many instances were found upon analysis, to contain so small an amount, if any, of the recognized or effective drugs or medicines, and such abnormally large percentages of alcohol, as to make their use as intoxicants not uncommon. Both male and female "patients" become addicted to their use, and in the manner cultivate a craving for alcohol. Public sentiment has been aroused, and a most successful ally was found in prominent magazines and

journals that quickly recognized the danger signal, and regarded the sacredness and purity of life beyond the value of ill-gotten pelf. The government has also assisted in the work of listing numerous "medicines" which come under the new ruling. The order takes effect on April 1st, next.

The Dairy and Food Commissioner took occasion to refer to this subject in a previous report.

In connection with this subject, it is proper to add, that the newspapers do not stop or retreat before obstacles, but endeavor to overcome them in the quickest possible time, when the good of the public is at stake.

CONCENTRATED COMMERCIAL FEED STUFFS.

The enactment of a law intended to regulate the sale of concentrated commercial feeding stuffs, prohibiting their adulteration, etc., has attracted widespread attention. The act in question is placed under the administration of the Secretary of Agriculture of this Commonwealth. The Dairy and Food Commissioner has nothing to do with its enforcement, as hundreds of correspondents erroneously supposed. The act is intended to remedy and prevent some of the wrongs that were at one time inflicted upon dairymen and others by unscrupulous dealers in many articles of cattle feed, who sold to unsuspecting customers feed that fell far short of the normal amounts of crude fat and crude protein. Various cheaper and inferior articles were substituted, but the greatest harm was perhaps, done as appeared in several notable instances, by feeding substitutes for proper animal food, which caused serious disturbances of the digestive organs of the animals, and, in some instances, their death. The term "concentrated commercial feeding stuffs," has a wide meaning, and as one who is especially interested in dairying questions, by virtue of the public position which he holds, the Commissioner can only express his hearty approval of this wise legislation, having observed tangible and convincing testimony of its value and efficacy. The improvement in the feed trade already noticeable, has its own special significance.

NUMBER AND VALUE OF CATTLE IN PENNSYLVANIA.

According to a statement just issued by the National Department of Agriculture, Pennsylvania's dairying interests include 1,097,590 milch cows with an estimated value of \$37,647,337. The same authority states that the number of other cattle in the State is 867,436, worth \$17.40 per head, or a total of \$15,093,386. Combining the two sums, the aggregate value of the cattle in Pennsylvania amounts to \$52,740,723. With the immensity of these figures confronting us, the average reader will not wonder why the farmers of the State are so deeply and seriously interested in the laws prohibiting the sale of fraudulent or illegal dairy products.

GROWTH OF DAIRYING INTERESTS.

For the continued moral support and unqualified endorsements proffered by the dairymen and farmers of Pennsylvania, through the medium of the Grange and farmers' organizations, as well as individually, the Dairy and Food Commissioner desires to renew his thanks and assurances of appreciation. It is difficult to comprehend

the extent of the interests which they represent, since it is a fact that every citizen is a consumer of dairy products in some form. And it can be accepted as sound doctrine that the average buyer and consumer does not want adulterated products or inferior substitutes at full, first-class butter prices.

The dairy farmer has been compelled to improve his methods of making butter, at an added expense, and it is but fair and proper that his interests should be protected.

In nearly every state there is in existence a State Dairymen's Association, whose sole effort is directed toward advancing dairy interests. The Pennsylvania Association has made forward strides, and the progress and development of the industry indicates a still brighter future and the growing importance of Pennsylvania as a dairying State.

The Commissioner is in hearty accord and sympathy with the work of the dairy interests, as the reports of his official work will prove. The true worth of the dairy cow is being demonstrated as never before, and while higher standards of quality are being demanded by critical consumers, there is also an increased compensation in values, because of the great demand for dairy products of the highest class or standard.

In a recent report it was stated that there are in the United States, thirty states that are prominently engaged in dairying. In these states there are over 320,000 exclusively dairy farms, and in round numbers, four million other farms on which there is some dairying done. Besides these there are about seventy-five thousand exclusively dairy farms in other states, and about one million five hundred thousand farms on which more or less dairying is being done. The same report asserts that there are fully 40,000,000 people in the United States who are consumers of dairy products and who do not produce any, depending solely upon the markets for their supplies. These figures form their own commentary.

INCREASED DEMAND FOR PURE MILK.

With the marked improvements in the production and care of milk, and the increasing knowledge of its comparative value as a food, its use is becoming more popular than ever before. The time has passed by when it is regarded as only proper for the infant and sick to use it freely. Containing as it does, all the nutritive ingredients needed for food, and as chemists assert, in about the right proportion for proper nutrition, its regular use is freely commended by many physicians. It is not a luxury; in fact, it is said to be the cheapest food, pound for pound, that can be purchased or used.

Recognizing these facts, special and frequent attention was given to the milk supplies of Philadelphia, Pittsburg, Allegheny and numerous other cities and boroughs during the year at more or less frequent intervals. The pages of the "Monthly Bulletin" show that the conditions are vastly better than at any time since the creation of the Dairy and Food Commissioner's office, which statement is further confirmed by the most remarkable decrease in the number of prosecutions brought against milk dealers. The use of chemical preservatives, formaldehyde, etc., which resulted in scores of prosecutions two years ago, has been almost entirely abandoned, because of the

frequent arrests and convictions. It is also a rare occurrence, comparatively speaking, to discover watered, skimmed and colored milk on the market, even during the warm seasons.

The careless, improper and indifferent methods of handling dairy products are being rapidly relegated to the past. Bottled pure, fresh milk, properly prepared and sterilized, is now readily attainable for the diet of the infant and invalid.

A learned scientific authority who urges the use of milk more generally, gives the ratio of the value of a quart of pure, whole milk in digestible nutrients, as follows:

Equivalent to nutrition in 1 pound beef chuck; 1 pound fowl; 1 pound veal shoulder; $\frac{1}{2}$ pound mutton leg; 9 ounces beef round; 9 ounces veal cutlets; in 2 pounds 5 ounces solid oysters; 2 pounds 5 ounces blue fish.

MILK SUPPLY OF PHILADELPHIA.

Before closing this report, it is but proper to state that the results of numerous investigations made in Philadelphia afford a base for the positive opinion that the milk supply of that city has no superior, if an equal, in any city in the United States. The sworn agents of the Dairy and Food Commissioner, assisted by special help, quietly collected many hundreds of samples of milk and cream for examination during the past year, with almost marvelous results. The work of sampling was done on Sundays, as well as week days, with the same satisfactory and pleasing results. The best residential portions of the city were frequently selected by the representatives of the Commissioner as a base for their operations, and then again they were assigned to collect samples from the dairymen or small dealers doing business or located in the so-called "slum districts," with almost equally encouraging and satisfactory results.

The educational campaign of 1904, although costly in dollars, was the means of saving scores of lives, not only in Philadelphia, but other sections of Pennsylvania. Thanks are especially due to physicians and others who frequently and effectually co-operated in carrying out plans and making the work successful. The milk dealers of Philadelphia, with very few exceptions, are law-abiding and deserve unstinted praise for their active interest in this vital question and in driving from the markets the virile poisons sold as milk years ago. The special help employed rendered able and intelligent service.

With a little more attention to sanitary conditions and surroundings, on the part of a comparatively few small dealers, the general conditions could not possibly be surpassed anywhere, so far as cities are concerned.

The Philadelphia Board of Health and Charities and Department of Public Safety also deserve praise, and the Dairy and Food officials' grateful acknowledgment for their continued and cheerful co-operation in the good work done in that city.

HEALTHFUL AND BETTER MILK.

At the instance of a number of health officials, prominent bacteriologists and chemists, the Dairy and Food authorities of Pennsylvania have been urged to make an investigation into the sanitary surroundings of milk producers and dairymen in various sections

of the Commonwealth. This would be a stupendous undertaking, and would require the expenditure of a large sum of money, if an exhaustive and careful examination were to be instituted.

The sweet, fresh and pure flavor of milk from a healthy cow is hardly ever mistaken by those who are well or invalid. It is also equally true that sickness and death may follow the use of germ-laden milk, or that which has been heavily dosed with formaldehyde and other preservatives. The drastic measures proposed by some persons are impracticable at this time, but it is confidently believed that by the co-operation of the State and local health authorities, a marked improvement in general conditions can be secured. In numerous cases, local boards of health are averse to performing their bounden duties, preferring that the State authorities should assume the entire responsibility and expense of examining the milk supply of their respective cities and boroughs. It is plainly evident that an educational campaign is necessary, and that if dairymen were to persist in selling unwholesome milk and cream, and fail to comply with even the most ordinary but sensible sanitary requirements regarding healthy cattle, proper stabling, feed and cleanliness, that they should be amenable.

The heavy infant mortality in cities is but one of the several dire penalties inflicted by the sale and use of unclean, unwholesome and chemically preserved milk. The tuberculous cow is another menace to our health and lives, but the number is being gradually reduced to a minimum through the excellent work done under the direction of Dr. Leonard Pearson, State Veterinarian, and the State Live Stock Sanitary Board. Dairy bacteriology has made marked strides in the best dairy interests, while the public demand a still higher standard. In general, the outlook for the future milk supply is most encouraging.

ILLEGAL USE OF MILK PRESERVATIVES.

A well informed and prosperous dairyman informed the Dairy and Food Commissioner that the crusade made against dairymen two years ago, who used formaldehyde and other preservatives in milk and cream, had produced a salutary effect and an almost phenomenal change for the better in milk supplies, generally. In extenuation of the vast amount of harm done to health previous to the rigid enforcement of the laws, the same dairyman further declared that in many cases, the purchasers of the so-called "harmless" preservatives were duped by glib-tongued agents misrepresenting their harmful compounds, and assuring the buyer that they were not only in full compliance with all milk and food laws, but perfectly harmless. As is well known, formaldehyde, commonly used for embalming dead bodies, was extensively sold under various names as a milk preservative. The same authority further reported that an examination showed that certain makers of preservatives had placed upon the market a liquid costing them, in bulk, 5 or 10 cents a gallon, and sold it at \$1.00 to \$1.50 per gallon. These manufacturers will no doubt continue their opposition to any pure food legislation that might tend to still further increase public confidence in the purity and integrity of the milk and food supply of Pennsylvania. The consequent decreased demand for their vile compounds is a heavy loss of profits, and it is to be hoped that the demand for

formaldehyde may ere this, have been restored to its proper channel and use, and will no longer be found in milk or cream, where it interferes with digestion and assimilation, to the detriment of the consumer, whether one of strong physique, or an invalid or child.

CONDENSED MILKS AND INVALIDS' FOODS.

At the urgent demand of many physicians and correspondents, Prof. C. B. Cochran, Chief Chemist of the Dairy and Food Commissioner, was directed to make a special analytical examination into the composition and quality of the condensed milks and infants' and invalids' foods, which were found on sale in the stores of this State. Physicians were especially interested because they desired more specific information in order that they might more intelligently plan the diet of an invalid or infant. The results of these analyses were published in the "Monthly Bulletin" and later also in pamphlet form to meet the large demand for this report. While there is a marked difference or inequality in the average cost of the numerous brands examined, as compared with the percentages of fat, protein and milk sugar supplied in the respective packages of sweetened, condensed milk, the comparative cost of milk per quart ranging from 6 to 21 cents, the general results show that the condensed milks upon our markets are made from milk of fairly good quality. The unsweetened condensed milks cover a greater variety of brands, and the compilation of figures proves interesting reading. With the facts presented in plain figures, the reader and particularly the physician, can readily form his own conclusion as to his wants.

The fraud which would be most profitable and easily practicable to the manufacturer of condensed milk, according to Prof. Cochran's report, would be the substitution either wholly or in part of skimmed milk for milk containing its full contents of fat; fortunately, as already stated, this form of adulteration is rare, if not almost entirely unknown. The main question in the case of many brands, is that of securing the greatest amount of nutrition in proportion to their cost.

OLEOMARGARINE LAW ENFORCED.

The aggressive effort made on the part of the special agents and representatives of the Dairy and Food Commissioner to enforce the requirements of the act of Assembly regulating the manufacture, sale and use of oleomargarine in Pennsylvania resulted in the collection of \$10,890.98 in fines and costs, an amount almost double that of any preceding year in the history of the Commission. The work was materially assisted through the reports received from secret agents, private correspondents and others who kept a close surveillance in various sections of the State where oleomargarine was likely to be introduced and sold without authority of law.

Dairymen are especially vigilant and while willing to meet fair competition, they are unwilling to have competition with unlicensed oleomargarine dealers, or to compete with colored oleomargarine. The unusual large amount collected for violations of the oleomargarine laws was due to a considerable extent to the fact that certain licensed dealers sold or offered for sale oleomargarine "made or so colored as to resemble or be in imitation of yellow butter," contrary to the act under which they were granted license certificates.

In a number of instances injunctions were granted by the Allegheny county courts against persistent or wilful violators of the law, who had previously paid fines and resumed the sale of the illegally colored butter substitute.

To this fact is also ascribed the decrease in receipts for retail licenses to sell oleomargarine, as some of those who formerly complied with the law declare that when offered uncolored, its sale is confined to greatly circumscribed channels, and, therefore, unprofitable.

The indisputable fact remains that if colored oleomargarine could legally be sold in Pennsylvania, a large proportion of the sales would be effected under the guise of genuine butter, and at butter prices. It was the knowledge of this condition which no doubt prompted the Legislature to pass legislation prohibiting the sale of colored oleomargarine in Pennsylvania under any terms.

OLEOMARGARINE AND RENOVATED BUTTER LICENSES IN 1905.

During the year 1905, the Dairy and Food Commission issued oleomargarine and renovated butter licenses, as follows:

Oleomargarine,	272
Renovated butter,	32
	<hr/>

An examination shows that these were subdivided as follows:

LICENSES ISSUED FROM JANUARY 1 TO DECEMBER 31, 1905.

Oleomargarine Licenses 272.

Boarding house,	8
Restaurant,	9
Retail,	244
Wholesale,	11
	<hr/>
Total,	272
	<hr/>

Renovated Butter Licenses 32.

Retail,	27
Wholesale,	5
	<hr/>
Total,	32
	<hr/>

The total amount received from the aforesaid licenses for 1905, aggregated \$31,623.26, and this amount was in accordance with law, deposited in the State Treasury to the credit of the Commonwealth.

ILLEGAL COLORING AND SALE OF OLEOMARGARINE.

As the United States statutes permit the sale of colored oleomargarine by properly licensed dealers, provided a revenue tax of ten cents per pound is paid upon such product and the article is not sold in conflict with state legislation upon the subject, there were dealers who believed that it could also be sold in Pennsylvania, notwithstanding the act of Assembly regulating the manufacture and sale of oleomargarine, which declares that no oleomargarine which

is colored to appear like butter can legally be sold in this State by any dealer, whether licensed or unlicensed. The license certificate issued to such dealer is, therefore, plain upon this point. Notwithstanding the prohibitory statute, numerous Western Pennsylvania dealers who disregarded this specific provision of the law, were arrested and fined. In the case of certain persistent and continued violators, the Allegheny county courts granted injunctions against such dealers, the mandamus proceedings being instituted by the local attorney. These proceedings attracted a wide-spread interest, and the pure food authorities of several states have applied to the Pennsylvania officials for a full description of the proceedings, in order that similar conditions in their own states may be remedied by the radical methods which have proven successful here.

Another interesting phase of the oleomargarine business in Pennsylvania is the recent development that certain licensed dealers who are engaged in the sale of uncolored goods are alleged to have supplied their patrons with capsules for coloring the oleomargarine in imitation of butter, after the sale was concluded, and in some instances, not until after the goods had been removed from the seller's premises. These capsules were given away, but the legality of the act has been severely questioned by both the Federal and State officials. In the first instance the oleomargarine is supposed to be sold in its natural, uncolored condition, and the addition of the coloring matter would quickly transform it into colored oleomargarine, which has no legal status, whatever, in Pennsylvania. In the second example, if the oleomargarine is colored yellow, it is in violation of the Federal statute, since the ten cents per pound revenue tax was not paid on the questionable goods. The United States revenue authorities in Philadelphia are quietly investigating the somewhat peculiar and complex situation, and their action will be awaited with interest by the trade generally. There are those who believe that the giving away of the capsules to patrons who bought oleomargarine with instructions how to color and improve its appearance might possibly be construed into a conspiracy to deprive the United States Government of its proper revenues. The State authorities believe in protecting licensed dealers, and recognize their legal rights, but when they disregard their privileges and transgress the National statutes, the Dairy and Food Commissioner is powerless to aid or defend them. The violation of law, in some instances, was practically, a double one.

COLORED OLEOMARGARINE ILLEGAL.

That the anti-color clause in the Act of Assembly intended to regulate the manufacture, sale and use of oleomargarine in Pennsylvania, is constitutional has been affirmed by the higher courts in several recent decisions. The oleomargarine dealers with but few exceptions are law-abiding, recognizing that the Commonwealth has the right not only to pass restrictive but also prohibitory legislation. The dairymen and farmers of Pennsylvania rejoice in these court victories, claiming that the protection against fraudulent dairy products has resulted in maintaining at least a normal demand for pure butter at remunerative prices. At numerous grange gatherings this subject met with a generous discussion, with the result that strong resolutions of thanks were adopted, and asking that the Dairy and

Food Commissioner should continue his "laudable work of protecting the dairying interests of Pennsylvania." It is gratifying to learn that the work has, at least, in a measure, met with public approbation. It is equally pleasant to assure the dairying and kindred interests that the work will not be relaxed, so long as the present officials of the Department of Agriculture and Dairy and Food Division remain in authority. Suffice it to state that the work already performed is the best and safest criterion as to the future course of this office.

HOW OLEOMARGARINE IS MADE.

Many correspondents have inquired for information concerning the manufacture of oleomargarine. The best available information is to the effect that it was first manufactured in France, instead of the United States, as many persons supposed. It originated in 1869, at the instance of the French government having offered a prize for the discovery of the best substitute for butter at a decreased cost. A Parisian chemist, M. Mege-Mouries, won the prize. The industry was early introduced into the United States, but the figures and history prior to 1869 are indefinite and unreliable.

The number and character of the ingredients of oleomargarine makes them susceptible of almost an infinite number of combinations, and to-day nearly every manufacturer has his own formula, and endeavors to impress his own individuality as a manufacturer upon his product. This fact is also responsible for the varying grades and prices.

Practically all of the oleomargarine made in this country is produced by the simple process of churning a melted mixture of oleo oil and neutral lard with milk, cream or melted butter to give it the butter flavor, and coloring matter to give it any desired shade of yellow in semblance of butter. In the cheap grades cottonseed oil is often substituted for a portion of the oleo oil and neutral lard, but never to the total exclusion of either. The French chemist was fully persuaded that the butter-fat contained in milk was absorbed from the animal tissues of the cow, and his attention was, therefore, directed to the discovery of a process that would separate from beef-fat the oil similar to that of milk. That he succeeded, the magnitude of the oleomargarine business thoroughly attests.

In order to give further information, the following formulas, showing different ingredients and their variation in quantity, are presented:

CHEAP GRADE OLEOMARGARINE.

	Pounds.
Oleo oil,	495
Neutral lard,	265
Cottonseed oil,	315
Milk,	255
Salt,	120
Color,	1¼
	<hr/>
	1,451¼
	<hr/>

Which will produce from 1,265 to 1,300 pounds.

MEDIUM HIGH GRADE OLEOMARGARINE.

	Pounds.
Oleo oil,	315
Neutral lard,	500
Cream,	280
Milk,	280
Salt,	120
Color,	1½
	<hr/>
	1,496½
	<hr/>

Producing from 1,050 to 1,080 pounds.

HIGH GRADE OLEOMARGARINE.

	Pounds.
Oleo oil,	100
Neutral lard,	130
Butter,	95
Salt,	32
Color,	½
	<hr/>
	357½
	<hr/>

Will produce about 352 pounds of oleomaragarine.

THE USE OF BUTTER COLORS.

The constant activity in enforcing the oleomargarine and renovated butter laws of Pennsylvania has brought counter-charges on the part of the representatives of the oleomargarine trade against the use of coloring matter in butter. Some of them assert that there is no good reason why the artificial coloring of the product of the cow should not be prohibited, since ordinarily such butter naturally possesses a distinctive yellow tinge or shade. It is further declared by the anti-oleomargarine friend that there are seasons of the year when butter must be artificially colored in order that it may bring the highest market prices. They also claim that the use of vegetable coloring matter on the part of the dairymen and farmer is now almost unknown, and that those harmless materials have been largely superceded and supplanted by various coal-tar colors, some of which, at best are of doubtful utility, if not positively injurious to health. The use of annatto, which was also very common at one time, for a number of reasons, has also yielded to the more effective coal-tar product.

The state of Minnesota enacted a pure food law forbidding among other things the use of aniline butter colors, and later, the officials in charge suspended the enforcement of the law, fearing that the state would quickly lose its prestige in the markets, since other states permitted the alleged harmful or questionable coloring.

The subject is one that should not be confined exclusively to commercialism. The average farmer and dairyman is honest and has conscientious scruples, and he will not knowingly poison his customers; but on the other hand, he is, perhaps, justified in still believing the story that a lard and tallow compound was formerly

colored and sold to the unsuspecting customer as butter at regular dairy butter prices. Two wrongs never made a single right, and this subject is therefore, likely to reappear for proper and full consideration during the next session of the Legislature.

BUTTER PRICES IN 1905.

The dairymen of Pennsylvania report that the year 1905 showed rather extreme variations in the prices of creamery butter in both New York and Philadelphia wholesale markets. In the city of New York, the quotations for extra creamery butter show that in the month of February, the prices ranged from $29\frac{1}{2}$ cents to $35\frac{1}{2}$ cents a pound, while the lowest prices realized were those of November, with a minimum of $17\frac{1}{2}$ cents and a maximum of $24\frac{1}{2}$ cents a pound.

The Philadelphia prices showed an equal wide range of values, and, as the months cited indicate, the season was not the sole factor in the fixing of values.

In many instances the Pennsylvania butter-maker, and especially if he produces an article of merit, has yearly contracts with large consumers, such as hotels, restaurants, etc., with a fixed and uniform figure for the entire output. This plan guarantees to the consumer that he can depend upon receiving a good article, while the producer is satisfied with the price realized and also knows full well that their mutual interests are closely interwoven.

This plan saves the commission and incidental expenses of middlemen. The distribution and sale of all farm products with the minimum of expense, is an absorbing question, and bright commercialism upon the farm is a factor that can no longer be ignored by those who would reap the greatest profits and succeed best in their calling.

ABNORMAL AMOUNT OF WATER IN BUTTER.

The records of this office show that a number of prosecutions were directed against butter dealers in Western Pennsylvania charged with the sale of butter containing highly excessive quantities of water, which was added to normal butter by a peculiar process of manipulation, and, therefore, intended to deceive the purchaser and increase profits.

It is usually understood that pure butter containing $82\frac{1}{2}$ per cent. of fat might be accepted as an average standard, but the results of an examination showed that some butter contained even less than 80 per cent. of fat, when freshly made, while other samples scored correspondingly high. The general average above specified is a fair and normal one, and as the butter upon which the prosecutions were based contained 30 to 40 per cent. or even more water, the imposition practiced was self-evident. It was an opportunity for illegal gain that fortunately for the consumers, was soon nipped in the bud, and as the defendants were convicted, the manufacturers probably suspended operations in that special and unique line of adulteration. With butter commanding from 30 to 50 cents a pound, the new industry would soon have developed into one of surprising magnitude and capabilities for gain.

FRAUDULENT DAIRY PRACTICES.

As has been contended in various prosecutions, many of the more common modes of adulteration cannot be regarded as anything

else than plainly swindling the public. One of the fraudulent practices recommended by a firm was the use of a formula which would enable the dairymen and others to double or greatly increase the amount of butter by the use of certain chemicals as compared with the normal percentage of butter fat in milk and cream. The recipe, was extensively advertised until the attention of the government authorities was called to the obvious fraud. The manufacture and sale of such butter would undoubtedly conflict with the pure food laws of this State.

In another case, the advertiser offered for sale a preparation which was to be used as a "cream thickener." While the article in itself may not be positively poisonous in its nature, it will give to cream and milk, when combined, the appearance of a rich, thick cream. On the other hand, if the cream is subjected to the usual test for fat contents, the purchaser will find that he has been imposed upon and that the so-called cream in most cases is a very poor substitute, indeed.

The use of coal-tar colors and other dyes and chemicals in milk and cream to hide inferiority was common several years ago, but the enforcement of the laws has resulted in the discontinuance of the practice. Watered and skimmed milk was frequently colored, so as to give the appearance of pure, rich milk, thus deceiving the purchaser and possibly harming the consumer because of its lack of nutritive elements. This was especially unfortunate when such milk was used by infants and invalids whose main dietary was supposed to consist of good, rich and wholesome milk.

IMITATION DAIRY PRODUCTS IN PUBLIC INSTITUTIONS.

The act of Assembly prohibiting the use of oleomargarine in charitable and penal institutions in Pennsylvania, is being fully observed, so far as is known to the officials of this office. A number of years ago, numerous institutions of the kind indicated, used oleomargarine instead of butter on account of its comparative cheapness. Due notice upon several occasions was afforded to all concerned that the practice was illegal, and a few prosecutions followed, which action produced the desired observance of the statute.

In Philadelphia and Pittsburg certain special agents made careful examinations without discovering a single violation of the aforesaid law.

In connection with the subject, it is also proper to explain that neither a superintendent or warden of such institution could obtain a license permitting the use of uncolored oleomargarine, such as is issued to the proprietors of hotels, restaurants and boarding houses upon the payment of certain prescribed fees. Its use in boarding the inmates of such institutions is absolutely prohibited.

COLD-STORAGE EGGS.

The sale of cold-storage eggs as freshly laid stock, at the prices of such, is an evil which has assumed large proportions and caused much criticism. This subject was discussed in a previous report, and so far as the Dairy and Food Commissioner is concerned, there is, unfortunately, no statute under his charge which will assist in correcting the abuse.

In Massachusetts a number of persons appeared to be doing a thriving business in "egg-white," "egg-yolk" and "mixed eggs," the purchasers being bakers who had been led to believe that the material was derived solely from fresh eggs cracked in transit. Later it developed that the stale eggs were sold, and that their offensive odor was completely neutralized by the use of formaldehyde; in fact, the demand for fresh eggs, because of this discovery became so great that the prices of otherwise almost valueless stale eggs advanced over one dollar per crate. It was said that one large baking establishment had for a long time bought as much as a thousand pounds of "mixed eggs" daily in the belief that they were fresh and wholesome cracked eggs; and eggs not too far advanced in decomposition could be separated into "egg-white" and "egg-yolk," but those which were quite stale and practically rotten, could not be separated, and, therefore, their contents were mixed thoroughly together, treated with the deodorant and preservative, and sold to the unsuspecting producer of choice (?) pastry. A few prosecutions placed bakers on their guard, and exposed the fraud and the business came to an end, so far as that state was concerned.

Cakes and pies should be, like Caesar's wife, entirely "above suspicion;" and in truth, there are good reasons which justify the demand for legislation upon this subject. If cold-storage eggs are sold as fresh laid stock, it is an imposition and a deception. The matter is worthy of future consideration.

COLD-STORAGE POULTRY.

The oft-discussed question as to the healthfulness of poultry that was not drawn at the time of killing, and which was kept in cold-storage for days, months and even years, before it was sold to the consumer, was again brought to the attention of the Dairy and Food Commissioner during the past year with more or less frequency.

It developed through investigation and a series of correspondence that fowls are killed some times without bleeding, packed before entirely dead and frozen solid without removal of entrails. It is needless to state that the presence of undigested food and excrementitious substances in such fowls, must, necessarily taint the flesh and assist in its decomposition, and particularly because of the fact that the frost is either wholly or partially removed after the fowls leave the cold-storage chamber and before they reach the consumer. Bacterial action and ptomaine poisoning quickly appearing with the actual putrescent condition which already exists, the danger to life is unquestionably a serious one. This question is one that certainly demands consideration at the hands of our next Legislature.

It is gratifying to know that certain cities and boroughs through their local powers have already forbidden the sale of dressed poultry, which was not drawn before being offered for sale. Poultry which was killed a number of years ago, and placed in refrigeration should be sold for what it is, and it should also have received proper and careful treatment before being stored away for the indefinite future.

POULTRY PROFITABLE IN PENNSYLVANIA.

The poultry industry of Pennsylvania is constantly increasing in importance and value. It is reasonable to predict that in a compara-

tively few years, numerous farms will be almost exclusively devoted to poultry breeding. The demand for first-class dressed poultry is increasing, and the epicurian is determined to have the best, even though fancy prices are asked. The market might possibly be overstocked with antiquated, cold-storage poultry, but fresh picked and good stock never lacked a market.

The large duck breeding farms established in Eastern Pennsylvania, which are now selling thousands of water-fowls as compared with the few single specimens to be seen on the market stalls years ago, demonstrate not only a growing demand for such stock, but the fact that there is money in poultry raising.

The egg market during 1905 was characterized by a high range of prices. On many farms, even with indifferent treatment, the poultry crop proved as profitable as the crop of cereals. Where intelligence was exercised, the American hen surprised the farmer by her ability to yield a large profit.

The New York produce reports show that in June, 1905, fresh eggs in wholesale lots were sold at from 16½ cents to 22 cents a dozen, while during November and December the prices ranged from 28 cents to 40 cents a dozen. The extreme wholesale prices for the two months just named were not only easily obtainable, but on some days the market was almost entirely bare of strictly first class stock. These facts need no further commentary. The evolution of agriculture towards poultry raising should be encouraged. The average housewife on the farm knows full well the profitableness of the egg basket, and the incomparable advantage of fresh eggs and fresh dressed poultry.

VALUE OF GROCERS' ORGANIZATIONS.

That the agitation of the pure food question has been prolific of genuine benefit in numerous and diverse directions, is unqualifiedly true. The grocers of the United States have a national organization, with many state organizations radiating all over our wide domain, and these in turn, are ably assisted and sustained by hundreds of subsidiary trade organizations. In addition to the above facts, food expositions have been inaugurated to help along the good cause, and the food industry never fails to rally upon such occasions. The exhibitions held during the past year, generally speaking, were the most successful in every sense in the history of the trade. As an advertising medium, their value can scarcely be over-estimated.

Another important feature of these organizations is the fact that members are elevated upon a higher plane. They work together harmoniously, and petty jealousies, unscrupulous business methods and damaging price cutting are an almost unknown factor in these modern business times. The social feature is almost equally prominent, and adds materially to their success.

INTERNATIONAL STEWARDS' ASSOCIATION.

It is very gratifying and a subject deserving of warm commendation to note the live interest in the pure food subject which is being displayed in various practical ways by the influential organi-

zation known as the International Stewards' Association. The Pennsylvania branch, with its enthusiastic membership and thorough organization, is composed of the managers and stewards of many of the best hotels and clubs in the State. At the annual meeting of the International Stewards' Association, held at Atlantic City last summer, they reiterated their determination to continue a determined and active warfare against all adulterated, harmful and counterfeit articles of food and drink. The sessions were largely devoted to this vital subject and their unanimity of action proved their earnestness in the laudable work. This organization will present to Congress an appeal for additional pure food legislation, which will contain more names than any petition ever presented to that body. It is estimated that the paper bearing the signatures will weigh about a ton. The association makes large displays of adulterated articles of food and drink, secures competent lecturers, and in various other directions wages an educational campaign that cannot fail to produce most excellent and lasting results. Their policy is especially praiseworthy, since no admission fees to the exhibitions were charged, and all of the proceedings were open to the public, generally.

It is proposed by them that the Dairy and Food officials of the various states should co-operate with them, and in that manner work together for the common good.

The organizations that are being effected in numerous cities and boroughs for the betterment of civic and social conditions are also joining in the fight against adulterated and deleterious articles of food and drink. In fact, the signs of the times clearly indicate that the work of the past few years has reached the minds and hearts of the people, and that they are awake to the dangers of the hour.

With these numerous powerful and influential organizations standing as a unit against the attempt to remove the barriers which interfere with or prevent the sale of illegal food commodities, there is increased hope for the continued success of the warfare against adulteration.

FOOD EXAMINATIONS IN ENGLAND.

The subject of food examinations receives extraordinary attention in England, the annual report of the Local Government Board showing that in 1904-1905, the total number of samples analyzed was 84,678. Of this number 7,173, or about 12 per cent., were reported as not in strict compliance with law, and legal proceedings were instituted in 3,707 cases. Of 15,000 samples of butter examined by public analysis, the proportion reported against was 5.70 per cent., and these were largely such samples as were pronounced "butter substitutes" or oleomargarine. It is also interesting to note that in England, sixteen per cent. of water is the maximum limit and any excess beyond the above named amount subjects the butter maker and seller to prosecution.

During the year just ended, the Dairy and Food Commissioner of Pennsylvania successfully prosecuted several defendants, who, by special manipulation, made and sold butter with an highly excessive amount of water.

Before dismissing this subject it might be stated that the conditions in Pennsylvania, as compared with England, are decidedly

superior so far as the percentage of adulterated food is concerned. Just three years ago the conditions were the reverse and less favorable. A vigorous campaign on the part of the Dairy and Food officials has produced salutary effects, and the reports of the State chemists unmistakably prove that the improvement is gradual and permanent.

In Germany contractors are forbidden to supply food containing boric acid for the use of the army and navy. Experiments made show that meat preserved with a mixture of salt and borax will eventually produce gastric derangement in all those using it. In Pennsylvania the law is equally stringent upon this question. Some of the meat packers claim that the quantity of boric acid employed as a preservative is too small to be capable of producing any harm. The fact that the quantity used may be small has no bearing on the legal phase of the subject.

The court decision in the famed case of *Commonwealth vs. Kevin*, supports this allegation. It is a well-known fact that the constant repetition of a small dose may produce effect, when a single administration of the larger quantity would fail in its action. This rule is frequently exemplified in the practice of the physician. If the pharmacist and physician must exercise extraordinary care in prescribing such drugs for certain definite purposes, it would be decidedly improper and even absurd to let the butcher, dairyman, etc., "dose" their patrons whether knowingly or without their knowledge and consent. Their use is not really necessary, and the people of Pennsylvania were wise in demanding such legislation as would prohibit the use of preservatives which are acknowledged to be harmful.

The use of chemical preservatives for other than legitimate purposes is under the ban in this State. Its use to conceal incipient putrefaction and to enable a certain class of dealers to palm off stale and questionable food products, can no longer be tolerated.

LEGAL PHASE OF THE WORK.

The national importance of the question of adulteration of food is fully shown by the fact that as much as from one-third to nearly one-half the income of a large portion of the average working classes is spent in the purchase of food. With this statement in mind, there are many and sufficient reasons for the continual efforts of all philanthropic citizens to protect the public health and to prevent dishonest or unscrupulous manufacturers and dealers from committing offenses against the Dairy and Food Laws of the Commonwealth. In the opinion of many eminent attorneys and chemical authorities the question as to the propriety and legality of such legislative enactments appears to be plain; that they were absolutely necessary for the protection of the health and lives of the public, and, in consequence, their enforcement has naturally become a part of the police regulations of the Commonwealth. Nothing is more needed than legislation that will afford still better protection to the health of the public.

PRAISE DUE TO CHEMISTS.

The chemical laboratories of the Dairy and Food Commissioner were busily occupied during the year, as the thousands of analytical

reports printed in the "Monthly Bulletin" will show. That the adulteration of food products is now a fine art and approaches nearer to a science than ever before, cannot be controverted. In view of the many difficulties which encompass the analytical field, the Commissioner feels gratified to be able to report that in not a single instance has any one been injured or harm done by the publication of an analysis. Whether analyzed to determine the nature of the constituents, or whether one or more foreign substances are to be sought for; or whether a quantitative analysis is to be made, or whether only proportions of only one or two constituents are desired, these chemists bestow the same careful and conscientious work upon the sample. The attention of those specially interested in the analytical work done during the past year is invited to the "Monthly Bulletin" which contains a large proportion of the analytical reports received from the several laboratories.

FAIRNESS OF NEWSPAPERS.

The Pennsylvania press, with very rare exceptions, it is pleasant to note, has again remained loyal to the objects and purposes of the Dairy and Food Commissioner, recognizing that the work performed was that of public necessity, and that the officials, as true friends of pure food, deprecated sensational and false statements, knowing that such a course would be certain to produce a revulsion and rather thwart, instead of aiding the cause of fairness and justice in executing the laws. The people of Pennsylvania, through the medium of the newspapers, have learned much of all the phases of food manufacture, introduction and distribution.

For their continued help, equitable and just treatment of all matters relating to the work of this Division, grateful and appreciative acknowledgments are due and are hereby freely tendered to all the newspapers and the fraternity in general.

HOW COMPLAINTS ARE CONSIDERED.

The charge of espionage, informant, etc., is not agreeable to the mind of the average individual, and for this reason there are many persons unwilling to co-operate in the work of enforcing the dairy and food laws. In nearly every case where correspondents saw proper to call the attention of the Commissioner to alleged wrongs, such parties would insist that their communications should be destroyed after reading, and that the source of information be regarded in the strictest confidence. These requests were regarded inviolate, and in nearly every instance the charges brought were fully sustained and the evil stopped. Numerous violations of the oleomargarine laws were brought to light through the medium of unknown but friendly correspondents, and the service was, therefore, welcome and appreciated.

In some instances where the regular special agents of the Division were well known in a district, thus making the collection of evidence doubly hard, if not entirely impracticable, the Commissioner secured the services of intelligent and trustworthy representatives to visit such sections, and to make a careful and thorough examination into the prevailing conditions. That the course adopted was a wise one, the results obtained amply prove.

The unselfish co-operation of the public is desired, and when complaints are free from self-apparent sinister motives, they receive prompt and most careful attention. Anonymous letters are not entitled to any notice or consideration.

REQUESTS FOR IMPROPER ANALYTICAL WORK.

Although the attitude of the Dairy and Food Division upon the question of analyzing food samples for the private information of manufacturers, dealers and others, has been repeatedly explained, many parties are still under the erroneous impression that it is the bounden duty of the Commissioner to make such analytical examinations.

It is, therefore, proper to again reiterate the fact that neither the laboratory facilities nor financial resources would be adequate to meet the demands, if the precedent were once established, while the proper legitimate work of the Division would suffer and be practically annulled if such requests were granted. The Commissioner is also aware of the indisputable fact that in many cases such official chemists' reports are primarily wanted for use in advertising certain goods, a feature which cannot properly be tolerated for obvious reasons. The unscrupulous manufacturer or dealer could very readily submit a sample of undoubted purity and excellence for the proposed analytical examination on the part of the State chemist, secure the desired official endorsement, and afterwards flood the stores with goods of an inferior and illegal character. For these and other reasons which could be cited, the Dairy and Food Commissioner could not consistently grant the frequent requests received asking for analyses of the varied food and drink products. On the other hand, if the sworn special agents of the Division purchase such samples in the stores, they can be examined with entire propriety, and the results are then published in the "Monthly Bulletin." This plan also avoids in a measure the frequent duplication of samples, thus saving considerable money and the added expense of repeating analyses, which naturally follows when the samples are submitted to the chemists located in Western and Eastern Pennsylvania, repeatedly. Where duplications are discovered, the chemists are authorized to discard them, unless in the case of products which are found to be adulterated.

DANGER LURKS IN WOOD ALCOHOL.

The improper use of wood alcohol as a substitute for the true alcohol, known as the natural product derived from sugar in the process of alcoholic distillation, has given cause for well-founded alarm. Wood alcohol has its various uses, and cannot be properly condemned when confined to legitimate purposes, but when it is introduced into whiskey and other drinks, medicinal preparations, witch hazel, toilet waters, hair tonics, liniments, etc., its use at once becomes a serious menace to health. The cheapness of wood alcohol is the leading incentive for its use in the manner intimated, but when it may cause blindness and other serious physical trouble, there is no valid reason for its toleration in drinks, medicines, etc. Systematic observation prompts the firm opinion that the next Legislature should enact a law that would prohibit the sale or use of any preparation intended for external or internal use in any

shape or form, whether by man or domestic animal, which contained wood alcohol. Its stupefying and intoxicating effects are especially pronounced, and it is claimed that deaths were accredited to its use where drinkers consumed it while partaking of distilled or alcoholic liquor supposed to be commercially pure. Pennsylvania produces a large quantity of wood alcohol, but the manufacturers have no desire to dispose of their product for any improper or harmful use. In other cases, it is said, that representatives of foreign firms boldly declared that refined wood alcohol could be safely and profitably substituted for grain alcohol in the manufacture of remedies intended solely for external use. It is unfortunately true that some druggists are, therefore, compounding spirits of camphor, liniments, bay rum and other preparations with this insidious poison.

It is sincerely regretted that the officers of the Dairy and Food Division have no jurisdiction over such adulterations. There is some consolation in the knowledge that the present conditions lead to a cultivation of the tastes of the people for milder beverages.

A PERSONAL RESUME OF THE SITUATION.

While there are available unobjectionable methods of preserving foods, and while there is no proven real or actual need for the many fraudulent and deceptive practices of food adulterators, resulting in injury to health and financial loss, the Dairy and Food Commissioner of Pennsylvania is free to admit that his duties as a sworn officer of the Commonwealth, who has worked hard and conscientiously, have not always received full approbation on the part of those directly affected. The results, however, are justifying expenditures, and the future will still further show the value of the work, and the fact that Pennsylvania again leads in its campaign for pure food and drink.

The greater the activity and faithfulness of the official obligated to protect the health of the public, the more frequently will criticism and antagonism be aroused. This statement is made in the additional knowledge of the fact that certain interests representing millions of dollars are inimical to food laws, and that they will not only contest the common laws, but probably will attack the constitutionality of the office of the Dairy and Food Commissioner, if the opportunity offers. The position is a most responsible one, and he who fills it with a conscientious determination to perform its duties as a champion of pure food will soon learn that it is not a "flowery bed of ease."

For the continued public confidence, encouraging words and co-operation of the unprejudiced and right-loving citizens and the press, the clergy, grangers', grocers' organizations, employes, etc., and particularly the constant, loyal support of His Excellency, Governor Pennypacker, and the Honorable Secretary of Agriculture, especial thanks are due and are hereby heartily acknowledged.

Very respectfully,

B. H. Warren.

Dairy and Food Commissioner.

REPORT OF THE STATE VETERINARIAN.

HARRISBURG, PA., *January 1, 1906.*

Hon. N. B. Critchfield, *Secretary of Agriculture:*

Sir: I have the honor to present the following report upon the work of the State Livestock Sanitary Board and of the State Veterinarian for the year 1905.

The work of the year has been unusually exacting on account of the exceptional prevalence of two diseases, rabies and glanders. With respect to other diseases, diminished prevalence can be reported. Particular progress has been made in the repression of anthrax and of tuberculosis. The good results of the work that has been conducted against anthrax is especially gratifying because this disease has been introduced in a large number of localities in this State, chiefly through foreign hides treated in Pennsylvania tanneries.

Anthrax is such a virulent disease and it is so difficult to eradicate it after it is once established in a locality, and it is spread with such facility, that it is a matter for congratulation that the disease is not only being held in check but is being steadily repressed. The unusual prevalence of glanders appears to be due to a great increase in the occurrence of this disease in the horse breeding states of the West. Nearly all of the western states from which horses are brought to Pennsylvania have experienced a considerable increase in the prevalence of glanders during the past few years. On account of the great activity of the industries of Pennsylvania there has been a strong and increasing demand for western horses to use in this State. Therefore, it has practically been inevitable that horses and mules with glanders should have been brought into Pennsylvania. In fact, most of the outbreaks of glanders that have occurred in the State have been traced very directly to infected horses from the West. But it is not only the West that threatens us with glanders; in New York city this disease prevails more extensively than in any other part of the United States, so that city-weary horses from New York, which are constantly being taken into country districts of neighboring states, have to be watched with great care lest glanders be introduced by them.

While rabies has prevailed rather widely during the year and has caused a large amount of damage, it is believed that the method that has gradually been developed for controlling it is becoming more effective and that outbreaks are now dealt with with greater certainty and that the disease will be controlled more quickly than has been the case heretofore.

A great advance in the work of the State Livestock Sanitary Board has been made possible through the enactment of an act of Assembly approved March 30, 1905 (P. L. No. 56), by which it is required that all practitioners of veterinary medicine in Pennsylvania shall, immediately upon gaining information thereof, report to the secretary of the State Livestock Sanitary Board the occurrence among animals of certain infectious diseases, specified in the act.

The report to the secretary of the Board shall be made in writing and shall include the description of the diseased animal or animals, the name and address of the owner or person in charge of the animal, if known, and a statement as to the location of the animal. This act also relates to several other features of the work of the State Livestock Sanitary Board and is incorporated, for reference as a part of this report. Two of the older acts relating to the work of the State Livestock Sanitary Board have been amended. The act approved May 21, 1895, and under which the State Livestock Sanitary Board is established, has been amended so as to authorize the Board more definitely to conduct scientific investigations in relation to the causes, nature and prevention of the diseases of domestic animals. The act approved May 26, 1897, under which it is required that dairy cows and cattle for breeding purposes coming into Pennsylvania from other states shall be inspected for tuberculosis, has been amended by prescribing penalties and a method of procedure for the enforcement of the provisions of the act. The last Legislature passed an act, which was approved by the Governor May 11, 1905, under which an appropriation of \$15,000 was made for the purchase of a site and equipment for the prosecution of research work concerning the diseases of animals. Under this appropriation a farm has been purchased in Marple township, Delaware county. The farm comprises about 150 acres and is well located for the purpose in view. At present the farm is being used chiefly for the purpose of accommodating and supplying food for more than one hundred cattle in experiments concerning the immunization of cattle against tuberculosis. It was hoped that a slightly larger sum might have been provided so that suitable quarters could be arranged for the accommodation of animals under study with reference to other diseases, such as abortion, calf cholera and hog cholera. Unfortunately, however, the condition of the State revenue was such that the additional sum of \$5,000 appropriated by the Legislature could not be approved. On this account the development of the plan with regard to the work that shall be conducted on this farm has been retarded.

The friendly relations that have heretofore existed between the State Livestock Sanitary Board and the live stock owners of the State have not been disturbed. This fact is mentioned because in some states rather bitter antagonisms have been aroused between the live stock owners and the live stock sanitary authorities. This has especially, and always, been the case when efforts have been made to deal with the infectious diseases of animals through a department of state government that is not in close touch and in sympathy with the agricultural interests; for example, when work of this character has been placed in charge of a state board of health. It is clearly evident to all live stock owners that the object and purpose of the work of the State Livestock Sanitary Board is to prevent the spread of infectious diseases among animals, and that this work is of more importance and benefit to the live stock owners than to any other class of the community.

Tuberculosis of cattle, instead of increasing in prevalence, as until recently it has steadily done for a long series of years, is now being restricted in prevalence. This statement is made on the basis of all the evidence that is available on this subject. Of course it

has never been possible to make a census of the tuberculous cattle of a state and ascertain the exact prevalence of this disease. Nor are there available, as a basis for such an estimate, slaughter house statistics showing the prevalence of tuberculosis among cattle killed for food. These statistics are not available because there is absolutely no systematic inspection of cattle entering the food supply, excepting the inspection by the federal government in two or three slaughter houses in Pittsburg and Philadelphia, and this inspection covers western steers chiefly, so that it furnishes little evidence as to the prevalence of tuberculosis among cattle in the different parts of Pennsylvania. There are, however, in a number of the larger cities of the State, municipal meat inspectors, who are engaged in the inspection of animals killed for food. These inspectors report a diminished prevalence of tuberculosis. They are finding notably less tuberculous cattle among those killed for food than was the case a few years ago. Experienced veterinarians in agricultural districts report less tuberculosis, less tuberculous infection among dairy cattle than was formerly the case. Similar reports are made by live stock dealers and by butchers. More accurate information is obtained by the test of herds with tuberculin. Such tests show a diminished prevalence of tuberculosis each year. All of the evidence agrees to the effect that tuberculosis is becoming steadily less prevalent. This speaks for the efficacy of the plan for controlling tuberculosis that is in operation in this State, the essential parts of which have been described in detail in previous reports.

As there are some recent modifications, however, it may be well to summarize the leading points. Briefly, the work that is directed against tuberculosis of cattle in Pennsylvania is composed of these parts:

(1) Cattle suffering with advanced or generalized tuberculosis or with tuberculosis of the udder, and known to practitioners of veterinary medicine, must immediately be reported to the secretary of the State Livestock Sanitary Board. Such animals are at once quarantined and are held in quarantine until they are destroyed.

(2) No animal afflicted with advanced or with generalized tuberculosis, or with tuberculosis of the udder shall be concealed or shall attempt be made to conceal such diseased animal, or knowledge of such diseased animal, from a member or agent of the State Livestock Sanitary Board. Furthermore, it is required that animals so afflicted may not be moved upon or across any public highway excepting upon a specific permit from a member or agent of the State Livestock Sanitary Board, and then only to be moved to some safe place of quarantine or to a place of slaughter.

(3) Dairy cows and cattle for breeding purposes brought into Pennsylvania from other states shall be tested with tuberculin and proven to be free from tuberculosis before they may be released from quarantine in this State.

(4) Animals killed for beef and found after slaughter to be afflicted with tuberculosis to such an extent that their flesh may not safely be used for food, must be condemned. The carcass may be appraised and may be paid for by the State Livestock Sanitary Board at a price not to exceed five cents per pound (for the dressed meat) or \$25 for the entire carcass, provided it can be shown that

the animal in question had been in the State of Pennsylvania for at least four months prior to slaughter.

(5) A herd owner who believes that tuberculosis exists among his cattle may apply for an inspection and tuberculin test of his herd at the cost of the State. The inspection is made subject to the condition that the herd owner will agree in writing to dispose of the animals that are found to be afflicted with tuberculosis as recommended by the State Veterinarian, that he will correct faulty sanitary conditions that are pointed out to him, that he will disinfect his premises, and that he will have a re-test made of his herd, at his own expense, within eight months from the time of the original inspection, provided 25 per cent. of his original herd have been found to be afflicted with tuberculosis. Furthermore, the herd owner is required to agree that he will add no cattle to his herd that have not been proven by the tuberculin test to be free from tuberculosis.

(6) A herd owner who has had his herd inspected at his own expense, and who finds that some of his cattle are infested with tuberculosis, may apply to the State Livestock Sanitary Board for assistance in disposing of the cattle that are infected with tuberculosis. This assistance is furnished under practically the same conditions as govern the cases where the herd is examined at the expense of the State.

(7) Cattle found in farmers' herds to be afflicted with tuberculosis may be handled, or they may be disposed of, in any one of several ways. The governing principle in each case is to prevent the spread of disease. If the tuberculous animal has special breeding value, and if the conditions are such that it may be kept with profit, and with safety to the public and to the live stock industry, the owner is encouraged to keep the tuberculous animal, unless the disease is advanced or generalized or involves the udder. If preserved, the animal must be kept in quarantine, apart from healthy cattle, and its milk must not be used for any purpose, even for the feeding of animals, without effective pasteurization. As it is usually unprofitable for herd owners to keep in this way cattle that have reacted to the tuberculin test, even though the animals may be very slightly infected with tuberculosis and may show no external signs of disease, it appears to be necessary, in most cases, under existing conditions, to arrange for the slaughter of tuberculous cattle. Such animals, if they show no external signs of tuberculosis, may be killed in a slaughter house subject to official inspection when they are killed. The flesh of such animals is adjudged in accordance with the rules that have been prescribed by the State Livestock Sanitary Board, and in accordance with the recommendations made by a special commission appointed to inquire into this matter. If the infection of the carcass is of such limitation that there is no danger that the flesh may be unwholesome, it is permitted to be used as food. If, however, there is any question as to the wholesomeness of the flesh, the carcass is condemned and is not permitted to be used for food. If the carcass is condemned, it may be paid for in accordance with its actual value, at a price not to exceed \$25.

(8) Where it is not practicable to dispose of tuberculous animals as above indicated, the animals may be appraised at not to exceed \$25 for unregistered cattle and at no to exceed \$50 for registered cattle, provided, however, that the amount of the appraisement

shall not in any case exceed three-fourths of the actual value of the animal at the time of appraisalment. After having been so appraised the animal may be destroyed and its carcass disposed of in some safe manner.

(9) Where a cow is appraised, as under the provisions of the preceding paragraph, if it is killed in a slaughter house, and it is found that its flesh may safely be used as food, the flesh is disposed of upon as favorable terms as possible and this amount is paid by the butcher to the former owner of the animal and is deducted from the official appraisalment.

(10) Vaccination of cattle against tuberculosis is just coming into use. As a result of the investigations that have been made by the State Livestock Sanitary Board there is every reason to believe that cattle may be so treated while young, that they may be rendered immune to tuberculosis for a term of years, possibly for life. This method of preventing tuberculosis is destined to be of great value to the breeding herds. It may be that it will also be found to be equally effective for mature cattle, and in this case it can be applied for the protection of members of herds that are recruited not by breeding but by purchase.

These are in general the leading features that enter into the crusade against tuberculosis of cattle in Pennsylvania. The plan that is in use has been developed greatly during a period of ten years, with reference to the special conditions existing in this State and with reference to the needs of Pennsylvania live stock owners. The work is proceeding in co-operation with herd owners, and would proceed at a more rapid rate if more money were available for its support.

Tuberculosis was spreading in Pennsylvania, as in all other eastern states, for many years. The disease cannot be eradicated quickly excepting at enormous expense, and even if eradicated completely it will still be necessary to continue a good deal of the work that is now being carried on to keep the disease permanently in hand. It is confidently believed that by means of the conservative, gradual method that is now in use, with such changes and developments as may be indicated from time to time as knowledge becomes more complete, will lead in time to the repression of tuberculosis to such an extent that it will be of little public health or economic importance.

Reference is made in a later part of this report to the relation of tuberculosis to the public health. The numerous investigations that have been made in this field during the last three or four years tend to emphasize the importance of a milk supply free from germs of bovine tuberculosis.

In September, an international veterinary congress was held in Budapest. These congresses are held at intervals of five years and they serve to bring together men from all parts of the world, many of whom are official government delegates, and who represent the most advanced thinkers and workers in the fields of the veterinary sciences. Tuberculosis of cattle, and especially the immunization of cattle against tuberculosis by vaccination, was one of the principal subjects arranged for the last veterinary congress. In view of the large amount of work in this field that has been done by the Commonwealth of Pennsylvania, through the State Livestock Sani-

tary Board, and in view of the importance of checking and comparing our results with those of others who have worked in the same field, I had the honor to be designated by the State Livestock Sanitary Board to represent it at the international veterinary congress. The meeting was the most successful that has ever been held. There were present nearly 1,400 members from more than thirty countries. All of the leading investigators in the subject of vaccination against tuberculosis of cattle were present or were represented. The existing status of this subject was made clear and the papers and discussions were very interesting and valuable. It came out very clearly, at this meeting, that one of the leading German writers on this subject who has been very boastful and extravagant in his claims on vaccination against tuberculosis does not have evidence for supporting his claims, so that if one were to accept them as they are made he would be misled and great disappointment and injury might result. Unsuccessful as well as successful efforts with vaccination were reported and discussed. Altogether, the information gathered in this field alone was most valuable and is now being employed advantageously in our experimental and practical work. The same information could not have been obtained by experiments and investigations at home without a very great expenditure of time and money. The congress listened with interest to an account of the work in this field that has been conducted by the Pennsylvania Livestock Sanitary Board, and it was clearly evident that our work is in the line of the most successful work in this field that is being conducted anywhere. In addition to the discussion of the subjects mentioned, other subjects of direct practical importance in the work of the State Livestock Sanitary Board were carefully considered, such as the control of rabies, anthrax, glanders, the relation of diseases of animals to public health, the development of a system for reporting infectious diseases of animals, and the improvement of the milk supply. A plan to increase the use of milk as food, and breeding and feeding of farm animals were also considered. There were a number of papers on so-called tropical diseases of domestic animals and on hog cholera, swine plague, foot and mouth disease and many other subjects. At the close of the congress, an executive committee was appointed to arrange for the next meeting to be held in 1909 in Holland. Your delegate was honored by being appointed on this committee to represent North and South America.

The act of May, 1895, places certain duties with regard to the control of the wholesomeness of the milk supply of cities and towns upon the State Livestock Sanitary Board. The general work of the State Livestock Sanitary Board in so far as it has to do with the repression of disease among dairy cattle is of service in protecting the wholesomeness of the milk supply, and it is but natural that if additional measures in this direction are to be undertaken by the State that the work should be placed upon this Board. The secretary of the Board has repeatedly been asked by borough and municipal authorities to ascertain conditions and take such action as may be necessary with regard to certain herds producing milk for sale within the limits of boroughs or cities. The Board is asked to undertake inspections of this kind because the local authorities have no jurisdiction beyond the limits of their districts. In a number

of instances the State Livestock Sanitary Board has been asked to arrange for the inspection of all of the herds producing milk for sale in certain towns. These requests have not in all cases been complied with because the financial resources of the Board have not been sufficient to enable it to undertake expenditures beyond those needed to repress disease where it was known or believed to exist.

The relation of the State Livestock Sanitary Board to the dairy inspection work of the State has been amended by section 6 of the act of March 30, 1905, the provision being as follows:

"Section 6. The State Livestock Sanitary Board may co-operate with any local board of health, in accordance with rules and regulations, and upon such terms of co-operation as may mutually be agreed upon, for the purpose of ascertaining the condition of dairy herds and of milk supplies, and for the purpose of protecting such milk supplies from contamination; and the State Livestock Sanitary Board may undertake, so far as possible, to bear one-half of the cost of such examinations as are made, beyond the limits of the jurisdiction of the said local board of health, for the purpose of protecting from contamination milk produced to be sold within the field of jurisdiction of said local board of health." Co-operation in the work of dairy inspection under the terms of this section is being discussed with a number of municipalities.

The laboratory of the State Livestock Sanitary Board is constantly taking a larger and more important part in the general work of the Board. More specimens are being sent to the laboratory for diagnosis and the laboratory is being depended on in constantly increasing measure by the practicing veterinarians and the live stock owners of the State. A great many cases that formerly could not be positively diagnosed are now diagnosed through the aid of the laboratory of the State Livestock Sanitary Board. This is the only laboratory of the State that is equipped and manned for the purpose of studying the diseases of animals and determining their nature. The value of its services are now so widely known and so fully appreciated that a great deal of work is thrown upon it. This work is of the highest importance to the efficacy of the veterinary sanitary administration of the State. By means of it, the accuracy of the field work is constantly controlled and new outbreaks are recognized and promptly dealt with, that otherwise, might not be recognized for a long time.

The research work of the laboratory has been directed chiefly toward the work of developing a practical system for vaccinating cattle against tuberculosis. It has been considered to be wise to concentrate all available energy on this problem so that it may be solved as quickly as possible.

In connection with the work of diagnosis, specimens have been received for examination with relation to anthrax, blackquarter, hemorrhagic-septicaemia, rabies, tuberculosis, glanders, pneumonia, forage poisoning, etc. A large number of samples of milk have been received for examination for tubercle bacilli, streptococci, etc. Many specimens of parasites have been received and of tumors and of other pathological material. The specimens submitted for examination for rabies numbered 96. Of these, 86 were from dogs, 3 from cats, 2 from horses, 3 from cows and 2 from children. By the examination of these specimens a positive diagnosis was made in 69

cases, a negative diagnosis in 18 cases, while the result was doubtful in 9 cases. A large number of diseased or dead fowls were received during the year. These included pigeons, squabs, chickens and ducks. Examinations were made in each case and the consignor was notified as to the result of the examination and was furnished such advice as was appropriate.

The demand for the biologic products of the laboratory has increased a great deal. During the year the laboratory made and distributed 20,230 c. c. tuberculin, about 600 doses of mallein and 836 doses of anthrax vaccine. The laboratory force has prepared the vaccine for use in all of the experimental work and also for vaccinating cattle in several herds. This work of the laboratory is destined to increase very greatly during the coming year. The laboratory has continued under the efficient direction of Dr. S. H. Gilliland.

A rather interesting and instructive investigation was made during the summer with relation to the milk produced by a herd in Wyoming county. The owner of this herd brought to my notice the fact that his customers complained that the milk, after it had been kept a day or two, developed little pinkish points or spots upon the surface. These pinkish areas gradually increased in size, and in depth of color, until the surface of the milk presented red patches and, from these, coloring matter went into the milk, giving the whole body of the milk a pinkish hue. The customers who had first noticed this unusual condition thought that the milk was contaminated or that it had been treated with chemicals. These views were at variance with my own knowledge of the intelligence and the high character of the dairyman, who was very much worried by the condition which was of the greatest importance to him, as it threatened to cost him his custom. It was evident, at once, that the difficulty was caused by the growth of a pigment producing organism in the milk. The fact that the trouble did not occur until the milk had stood for a time pointed unmistakably to this conclusion. If the red coloring matter had been due to blood or to a pigment introduced directly as the milk was secreted or drawn, the red color would have been most evident in the freshest milk. Since it is usual in such cases for contamination to enter the milk after it is drawn from the cow, instructions were given as to the disinfection of the premises, the cleansing of the cows, the sterilization of the utensils, and the disinfection of the place where the milk was stored, etc. All of these recommendations were followed very faithfully, but the trouble continued. Therefore, an examination was made of the milk of each cow in the herd. Dr. E. S. Deubler went from the laboratory to the farm to make this examination. By drawing a sample of milk from each cow into a sterile bottle and by setting these samples aside for observation, it was found that the red color appeared in the milk of but one cow. A further examination of the milk of this cow showed that only the milk from one quarter of the udder became discolored upon standing. The pigment in this case was produced by an organism resembling the *Bacillus prodigiosus*. The cow was obtained for study and a series of investigations were made with her milk. The organism causing the trouble disappeared completely after six weeks. It was possible to infect an uninfected quarter of a cow's udder by injecting into the milk cystem a small

quantity of this culture. After such an inoculation there was no change in the appearance or condition of the udder or of the milk excepting that the milk developed a reddish color after standing for one, two or three days.

Other bacteriological examination of milk have been made to determine the cause of a bitter taste of milk and difficulty in creaming, and these defects have been traced to the udder of a single member of a herd.

Expenditures. For the fiscal year ending May 31, 1905, the State Livestock Sanitary Board had available \$45,000 for its general work in repressing diseases of animals. Expenditures under this fund may be classified as follows: For tuberculous cattle, \$24,915.90; for glandered horses, \$679.50; for inspecting tuberculous cattle and herds, \$4,589.59, for inspections for the purpose of repressing disease other than tuberculosis, for vaccinations, etc., \$3,469.61; for the cost of enforcing quarantines, for materials used in making tuberculin, for making and shipping tuberculin, for the diagnosis of specimens, etc., \$3,746.70, for office and miscellaneous expenses, \$4,849.90; for the enforcement of the law requiring the inspection of cattle from other states, \$2,748.80.

The following laws relating to the work of the State Livestock Sanitary Board have been enacted since the publication of the last report:

No. 56.

AN ACT

To further define the duties and powers of the State Live Stock Sanitary Board; to prevent the spread of dangerous, contagious or infectious diseases among domestic animals; to require reports to be made of the existence of such diseases; to limit appraisements and payments for animals that it may be necessary to destroy to prevent the spread of disease; to protect milk supplies from contamination; to authorize co-operation with local boards of health; and to prescribe penalties for the violation of the provisions hereof.

Section 1. Be it enacted, &c., That all practitioners of veterinary medicine in Pennsylvania shall, immediately upon gaining information thereof, report to the secretary of the State Live Stock Sanitary Board the occurrence among animals of any one of the following diseases: Glanders, anthrax, blackleg, or blackquarter; contagious pleuro-pneumonia, or lung plague of cattle; rinderpest, or cattle plague; haemorrhagic septicaemia, foot and mouth disease, or aphthous fever of cattle; southern cattle fever, or Texas fever; sheep scab; mange of cattle or horses; hog cholera, or swine plague; rabies, or hydrophobia maladie de coit, or eldurine, of horses; advanced or generalized tuberculosis of the udder; or any other disease adjudged and proclaimed by the State Live Stock Sanitary Board to be of a dangerously infectious or virulent character.

The report to the secretary of the State Live Stock Sanitary Board shall be made in writing, and shall include a description of the diseased animal or animals, the name and address of the owner or person in charge of the animal, if known, and a statement as to the location of the animal.

Section 2. No person who has knowledge of the existence of any one of the diseases enumerated in section one of this act, or of an animal afflicted with any one of the said diseases, or with any other disease adjudged and proclaimed by the State Live Stock Sanitary Board to be of a dangerously infection or virulent character, shall

conceal or attempt to conceal such diseased animal, or knowledge of such diseased animal, from a member or agent of the State Live Stock Sanitary Board.

Section 3. It shall be unlawful to move upon or across any public highway; or to expose, to contact with other animals of the same species, or in any public place, any animal known to be afflicted with any one of the diseases enumerated in section one of this act, or with any other disease adjudged and proclaimed by the State Live Stock Sanitary Board to be of a dangerously infectious or virulent character, except upon specific permission so to do, from a member or agent of the State Live Stock Sanitary Board.

Section 4. No person shall inject into, or otherwise administer to, any domestic animal that is producing, or that is intended to, or that may, produce human food, or that is to be used as food for man, any virus or other substance containing pathogenic or disease-producing germs, of a kind that is virulent for man or for animals, excepting upon specific permission so to do, from a member or authorized agent of the State Live Stock Sanitary Board: Provided, however, That nothing in this section shall prevent the use of calves or other cattle for the production of vaccine, against small-pox.

Section 5. The maximum limit of appraisement that shall hereafter be allowed for animals that it shall be deemed to be necessary to destroy, to prevent the further spread of a dangerous, contagious or infectious disease, shall be as follows: For a horse or mule, forty dollars; for a bovine animal, of pure breed or registered stock, fifty dollars; for a bovine animal, of grade or common stock, twenty-five dollars; for a sheep or pig, ten dollars: Provided, however, That the amount of appraisement shall not, in any case, exceed three-fourths of the actual value of the animal at the time of appraisement: And provided further, That the total appraisements, in any one year, shall not exceed thirty-five thousand dollars.

Section 6. The State Live Stock Sanitary Board may co-operate with any local board of health in accordance with rules and regulations, and upon such terms of co-operation as may mutually be agreed upon, for the purpose of ascertaining the condition of dairy herds and of milk supplies, and for the purpose of protecting such milk supplies from contamination; and the State Live Stock Sanitary Board may undertake, so far as possible, to bear one-half of the cost of such examinations as are made, beyond the limits of the jurisdiction of the said local board of health, for the purpose of protecting from contamination milk produced to be sold within the field of jurisdiction of said local board of health.

Section 7. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction before any alderman, magistrate, or justice of the peace, shall be sentenced to pay a fine of not less than ten dollars and not more than one hundred dollars for each and every offence, together with all costs of the prosecution; and, in default of the payment of said fine and costs, shall stand committed until the same are paid. All penalties and costs recovered for the violation of any of the provisions of this act shall be paid to the secretary of the State Live Stock Sanitary Board, or to an authorized agent of said Board, and by him be immediately covered into the State Treasury.

Section 8. This act shall take effect June first, one thousand nine

hundred and five, and all acts or parts of acts inconsistent herewith are hereby repealed.

Approved.—The 30th day of March, A. D. 1905.

SAML. W. PENNYPACKER.

No. 68.

AN ACT

Providing for necessary medical attention to needy persons who may be in danger of suffering from hydrophobia.

Section 1. Be it enacted, &c., That in each and every county of this Commonwealth, it shall be the duty of the proper officers of the several poor-districts, in such counties, to provide all needy persons, in their said several districts, who may be bitten by dogs suffering from hydrophobia or rabies, with the proper medical attention to prevent the development of the disease in the person or persons so bitten, which medical attention may include the treatment known as the Pasteur treatment.

Section 2. All acts or parts of acts inconsistent herewith be and the same are hereby repealed.

Approved.—The 31st day of March, A. D. 1905.

SAML. W. PENNYPACKER.

No. 73.

AN ACT

To amend an act, entitled "An act to establish the State Live Stock Sanitary Board of Pennsylvania, and to provide for the control and suppression of dangerous, contagious or infectious diseases of domestic animals," approved the twenty-first day of May, Anno Domini one thousand eight hundred and ninety-five; so as to authorize the State Live Stock Sanitary Board to conduct scientific investigations in relation to the causes, nature, and prevention of diseases of domestic animals.

Section 1. Be it enacted, &c., That section two of an act, entitled "An act to establish the State Live Stock Sanitary Board of Pennsylvania, and to provide for the control and suppression of dangerous, contagious or infectious diseases of domestic animals," approved the twenty-first day of May, Anno Domini one thousand eight hundred and ninety-five, which now reads as follows:

"Section 2. That it shall be the duty of the State Live Stock Sanitary Board to protect the health of the domestic animals of the State, to determine and employ the most efficient and practical means for the prevention, suppression, control or eradication of dangerous, contagious or infectious diseases among the domestic

animals, and for these purposes it is hereby authorized and empowered to establish, maintain, enforce and regulate such quarantine and other measures relating to the movements and care of animals and their products, the disinfection of suspected localities and articles, and the destruction of animals, as it may deem necessary, and to adopt from time to time all such regulations as may be necessary and proper for carrying out the purposes of this act: Provided, however, In the case of any slowly contagious diseases, only suspected or diseased animals shall be quarantined," be and the same is hereby amended to read as follows:

Section 2. That it shall be the duty of the State Live Stock Sanitary Board to protect the health of the domestic animals of the State; to determine and employ the most efficient and practical means for the prevention, suppression, control, or eradication of dangerous, contagious or infectious diseases among the domestic animals; and for these purposes it is hereby authorized and empowered *to conduct scientific investigations in relation to the causes, nature, and prevention of diseases of animals*; to establish, maintain, enforce and regulate such quarantine and other measures relating to the movements and care of animals and their products, the disinfection of suspected localities and articles, and the destruction of animals, as it may deem necessary; and to adopt, from time to time, all such regulations as may be necessary and proper for carrying out the purposes of this act: Provided, however, In case of any slowly contagious diseases, only suspected or diseased animals shall be quarantined.

Approved.—The first day of April, A. D. 1905.

SAML. W. PENNYPACKER.

No. 76.

AN ACT

To amend the fourth section of an act, entitled "An act to protect the health of the domestic animals of the Commonwealth of Pennsylvania," approved the twenty-sixth day of May, Anno Domini one thousand eight hundred and ninety-seven, by prescribing penalties and methods of procedure for the enforcement of the provisions of said act.

Section 1. Be it enacted, &c., That section four of the act, entitled "An act to protect the health of the domestic animals of the Commonwealth of Pennsylvania," approved the twenty-sixth day of May, Anno Domino one thousand eight hundred and ninety-seven, which said section now reads as follows, to wit:

"Section 4. That any person, firm or corporate body violating the provisions of this act, shall be deemed guilty of a misdemeanor, and upon conviction shall, in the proper court of the county in which such cattle are sold, offered for sale, delivered to a purchaser, or in which such cattle may be detained in transit, for each offense, forfeit and pay a fine of not less than fifty dollars nor more than one hundred dollars, or be punished by imprisonment for not less than ten days nor exceeding thirty days, either or both, at the discretion of the court. Such person, firm or corporate body shall be liable for the full amount of damages that may result from viola-

tion of this act," be and the same is hereby amended to that the same shall read as follows, to wit:

Section 4. That if any person, firm or corporate body shall, by himself, herself or themselves, or by his, her, their or its agents or servants, violate any of the provisions of this act, every such person, firm or corporate body, and his, her, their or its agents or servant, shall forfeit and pay the sum of fifty dollars, which shall be recoverable, with costs, by any person suing in the name of the Commonwealth, as debts of like amount are by law recoverable; and justices of the peace and aldermen, throughout this Commonwealth, shall have jurisdiction to hear and determine all actions for the recovery of said penalties: Provided, however, That either or both parties shall have the right to appeal to the court of common pleas of the proper county, as provided by existing laws in suits for the recovery of penalties. In addition to the above penalty, every person, firm or corporation, and every officer, agent, servant and employe of such person, firm or corporation, who violates any of the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction thereof in any court of quarter sessions of the peace of the proper county, shall be sentenced to pay the costs and a fine of not less than fifty dollars, and not more than one hundred dollars, for each and every offense, or be imprisoned for not less than ten days nor more than thirty days, or both, or either, at the discretion of the court. In all prosecutions for a misdemeanor, under this section, the magistrate before whom the complaint is made shall have authority, in case the defendant admits the commission of the offense or requests the magistrate to hear and determine the complaint, to impose and receive the costs and fine, as provided herein. All penalties, fines and costs recovered for the violation of any of the provisions of this act shall be paid to the secretary of the State Live Stock Sanitary Board, or to an authorized agent of the said Board, and by him be immediately covered into the State Treasury.

Approved.—The 5th day of April, A. D. 1905.

SAML. W. PENNYPACKER.

Glanders. For reasons previously stated, there has been in increase in the number of cases of glanders. During the past year this disease has occurred in the following counties: Allegheny, Beaver, Berks, Butler, Cambria, Centre, Clinton, Crawford, Delaware, Elk, Erie, Lackawanna, Lancaster, Lycoming, McKean, Montgomery, Northumberland, Philadelphia, Wyoming and York. In all, 441 horses came under suspicion, some of them merely because they were known to have been in contact with horses afflicted with glanders. Seventy horses were found to be afflicted with this disease and were destroyed. The total appraisement of these horses amounted to \$1,440, being an average of \$20.57 per horse. Glanders occurred in eleven counties in which it occurred in 1904, and in nine additional counties. Nine counties in which the disease occurred in 1904 were unaffected during 1905. Thirteen cases occurred in

Philadelphia. All of these horses belonged to different owners except four, which were the property of one man. Fourteen cases occurred in Lancaster county. All of these horses were the property of one firm, having 35 horses. Some of the horses of this firm were afflicted with glanders while they were in Maryland and before they were brought into this State. All of the infection in this outbreak appears to go back to this source. Eleven cases occurred in Beaver county. All but one of these horses belonged to one firm having, altogether, about fifty horses. Nine cases occurred in Cambria county among a large number of mules that belonged to a company engaged in coal mining.

A number of horses that have reacted to the mallein test are still in quarantine at the end of the year, and are being held for the re-test. These horses show no symptoms of glanders and, although they have reacted to the mallein test their destruction is not ordered, because it has been found in some cases that horses in the very earliest stages of glanders may safely be kept alive and re-tested, and that in some such cases the disease appears to recede to such a point as to constitute recovery. This, however, is not believed to occur in any case, at least in this country, where the disease is so advanced as to have led to the occurrence of external symptoms. Where a horse reacts to the first test with mallein and fails to react upon three subsequent tests, with increasing doses of mallein, the tests being not less than a month apart, and if the horse during all this time is in good physical condition and develops no symptoms whatever of glanders, it is believed that it may safely be released from quarantine. If, however, the horse continues to react to mallein, this is taken as evidence that the disease is not receding, but that it is continuing in a more or less active form, and that the horse cannot safely be released from quarantine. This procedure has been followed in dealing with glanders for a number of years and thus far it has given satisfactory results. A large number of horses that have reacted once to the mallein test and that have subsequently failed to react have been released from quarantine and have been kept under observation for several years. They have not developed glanders nor have they transmitted glanders to other horses, so far as it has been possible to determine. It is evident, however, that this procedure can be safe only with relation to horses that have very recently acquired infection and then, probably, only in minimum quantity. If hypersensitiveness to mallein continues on successive tests, it is not believed that it is safe to take chances.

Such cases, may, however, appear to be rather difficult to adjudicate. A horse seemingly in perfect physical condition may have reacted to the mallein test two or more times. The horse shows no symptoms whatever of glanders but the mallein tests shows that he is afflicted. The owner of such a horse will sometimes protest strongly against having an animal destroyed or against it being kept in quarantine. It is, of course, possible that such a horse may safely be worked for a long time, and that for many months the disease may not develop to such a point as to enable this horse to transmit disease to others. Indeed, it is conceivable that in some rare cases (although it is not proven) the disease may remain stationary in such a subject and that during its whole natural life it

might not become a menace to other animals. On the other hand, it is certain that such horses usually, and often in a very short time, become capable of transmitting disease to other horses, and sometimes this occurs while the subject is still in apparent good condition so that he does not attract notice. In such cases, it is believed that there should be no hesitation in condemning the horse and that the thousands of healthy horses at work on streets and highways should have the benefit of any doubt there may be rather than that a horse properly under suspicion and known to be afflicted with glanders, even though to a slight extent at the time, should be released and given an opportunity to spread infection.

The new law requiring veterinarians to report all cases of glanders to the secretary of the State Livestock Sanitary Board is likely to be of service in dealing with this disease.

Anthrax. Anthrax occurred during 1905 in the following counties: Berks, Bradford, Chester, Lancaster, Lycoming, McKean, Potter, Susquehanna, Tioga and Warren. About fifty animals died in these various districts. Each carcass usually becomes a center of infection lasting for a series of years, if it is not promptly disposed of in a safe way. Every animal dying of anthrax should be cremated, if it is possible to do this. If cremation is not possible, the carcass should be deeply buried and covered with lime or encased in cement. All anthrax carcasses known were disposed of in some of these ways. Vaccine was distributed for eight hundred and thirty-six (836) animals.

In addition to the cattle and horses reported to have died of anthrax three deaths were reported among workmen in tanneries, one in Tioga county and two in Warren county. It appears that these workmen became infected from infectious hides—probably hides that had been removed from animals that had died of anthrax. It is known that such hides are exceedingly dangerous and many cases are recorded where men have become infected from them. The drainage from tanneries where such hides are worked upon is frequently infectious for cattle and it is chiefly in this way that anthrax has been distributed in Pennsylvania. The infectious hides that reach the tanneries are usually, if not always, of foreign origin. The United States government requires a consular certificate to the effect that hides shipped from foreign countries are from healthy animals and that they have been disinfected. In spite of these requirements, hides containing virulent anthrax bacilli are often imported. It has been observed in other states, and in other countries, that hides are among the chief agents in the distribution of anthrax, and it is largely through commerce in hides that anthrax has been carried into many parts of nearly all of the leading industrial countries. So far as the protection of the live stock is concerned, danger could be avoided very largely, if not wholly, by requiring all scraps of hides and scrapings to be thoroughly sterilized by boiling before they are discharged into streams. The vicious practice of some tanneries of discharging large quantities of raw sewage into the streams of the State constitutes a serious menace to the health of the live stock (to say nothing of the people), and it cannot be too strongly condemned.

Blackquarter. Blackquarter prevailed during the year 1905 in the following named counties: Bedford, Bradford, Erie, Fayette,

Huntingdon, Jefferson, Montgomery, Potter, Susquehanna, Warren, Wayne, Wyoming and York. The total number of reported deaths from blackquarter during the year is 154; total number of cattle vaccinated is 822. While these numbers are in excess of those previously reported it is believed that the excess is due to greater efforts directed toward the discovery of the disease than to increased prevalence. For example, in Huntingdon county, it was reported that young cattle were dying from an unknown cause. Investigation showed a group of ten farms where blackquarter has occurred repeatedly for a long series of years, and where it has caused very great loss, but the nature of the disease was not known and no report was made of it until this year. The act of Assembly approved March 30, 1905 (P. L. No. 56), is likely to be of service in bringing such outbreaks to notice. Of course this must be the first step toward any prophylactic measures. Last year for the first time advertisements were published in a number of papers issued in parts of the State where blackquarter was believed to exist. These advertisements were as follows: "Owners of live stock in county, whose cattle are exposed to the infection of blackleg or blackquarter, may have their cattle vaccinated against this disease by the State Livestock Sanitary Board without cost to the owner of the cattle by complying with the following rules:

"1. An application for vaccination shall be filled out and mailed to Dr. Leonard Pearson, Secretary of the State Livestock Sanitary Board, Harrisburg, before April 15, 1905.

"2. The application shall contain the name and address of the owner of the cattle, a statement as to the location of the farm upon which the cattle are kept and the number of animals in the herd.

"Vaccination cannot be made at the expense of the State Livestock Sanitary Board upon applications received after April 15th. For such cases vaccine will be furnished free of charge, but the owner will be required to defray the expense of employing the veterinarian to administer it."

As a result of this arrangement, which had been carried out previously with regard to anthrax, reports of the disease in new localities were received and it is believed that considerable loss was prevented.

Wherever there was reason to believe that cattle were exposed to the infection of blackquarter, they were vaccinated at the cost of the State. By this means, protection comes not only to the owner of the vaccinated cattle, but also to all other owners of cattle in that locality, and if vaccination is continued regularly and for a sufficiently long period, it should eventually lead to the complete eradication of blackquarter. This result cannot, however, be expected to come as promptly as results come from the vaccination of people against small-pox, because blackquarter is not transmitted directly from the diseased to the healthy animal; transmission is indirect from the carcass of the victim, through the soil. That is, the germs of the disease which are present in the animal pass, after the death of the animal, and as the carcass decomposes, into the soil, where they remain for several years constantly available for the infection of susceptible cattle. For this reason, vaccination against

blackquarter must be kept up for several years after the last case has occurred in a given locality.

Hemorrhagic septicaemia. This disease was reported during the year from the following counties: Bedford, Centre, Erie, Franklin, Potter, Tioga and Wayne. It is evident that hemorrhagic septicaemia is rather widely distributed throughout the mountainous sections of the State. The carcasses of animals dying of this disease should be promptly and thoroughly cremated. There is as yet no method known for vaccinating cattle against hemorrhagic septicaemia and so, for the present, reliance must be placed in the avoidance of special pastures known to be infested by the germs of this disease, and in properly disposing of the carcasses of the animals that die.

Hog cholera. The principal outbreaks of hog cholera during the past year have been in the counties of Bucks, Centre, Crawford, Cumberland, Delaware, Franklin, Perry, Susquehanna and Union. On the whole, the disease has not prevailed so extensively as for several years past. This is probably due to the fact that fewer hogs have been brought in from the West. It is chiefly among hogs that have been shipped that hog cholera occurs; even though the hogs are healthy when they leave the western farms, they are inevitably exposed to infection during transit, both in stock yards and in stock cars. The result is that it is very dangerous to purchase western hogs or hogs that have been shipped unless they are to be killed before the expiration of the period during which hog cholera may occur. To keep such hogs with the idea of raising or fattening them is to incur such a very hazardous risk that it is not justified by any possible profit from the transaction. The prevalence of hog cholera in Pennsylvania bears a very direct relation to the number of hogs imported from other states, and especially from the West. This depends very largely upon market conditions. When these conditions are such as to encourage the farmers of Pennsylvania to buy western hogs there is much cholera in Pennsylvania, and *vice versa*. Hog cholera does not appear to be stationary in any part of the State, and thus far it has been possible to prevent the extension of an outbreak beyond a single farm or a single limited group of farms. The situation with regard to this disease is very much as it is with regard to glanders. We are not breeding it at home; we exterminate it as rapidly as it is brought to us and, practically, we never have either of these diseases excepting as they are imported from other States.

Rabies. Rabies has occurred during the past year in the following named counties: Allegheny, Armstrong, Berks, Bradford, Bucks, Centre, Carbon, Chester, Clearfield, Clinton, Dauphin, Delaware, Erie, Huntingdon, Indiana, Jefferson, Lackawanna, Lawrence, Lehigh, Luzerne, McKean, Montgomery, Northampton, Northumberland, Perry, Potter, Philadelphia, Schuylkill, Somerset, Union, Venango, Warren, Washington and York. It appears, therefore, that rabies has occurred in more than one-half of the counties in Pennsylvania. Some of the outbreaks have been small and some have been rather extensive. In most cases the disease has been confined to dogs, and in every case the disease has been propagated only by dogs. Still, other animals have been bitten and the incomplete records show deaths from rabies of 6 horses, 47 cattle, 14 hogs and

151 sheep. A number of people have been bitten by rabid dogs, some by the same dogs that bit other animals that died of rabies, and there are records of several probable deaths of rabies among people.

Outbreaks of rabies are reported more promptly to the State Livestock Sanitary Board, and the services of the State Livestock Sanitary Board are more frequently asked for with relation to the repression of rabies than has been the case in former years. Previously, upon the occurrence of a rabid dog in a borough it was the custom to ignore the matter or to require the muzzling of dogs in that borough for a limited period, generally of about thirty days. The rabid dog that caused the alarm may have come from outside of the borough or from another county, and it may have bitten dogs in surrounding districts before or after having made its appearance in the borough. Under such conditions, a muzzling order applied to dogs in the borough could not be effective, because there is in such cases a probability that the disease has been implanted in animals in the surrounding country. In these cases the State Livestock Sanitary Board is being called upon by borough authorities, first, to assist the borough in establishing and maintaining a quarantine of dogs and, secondly, to do what the borough cannot do directly, in establishing a quarantine of dogs in the surrounding districts. This recognition of the value of the co-operation of the State Livestock Sanitary Board, and the enactment of the law (P. L. No. 56) requiring reports of rabies to be made promptly to the State Livestock Sanitary Board, have both led to reports of more cases and to what is an apparent and not a real increase of the prevalence of rabies throughout the State.

The enactment of a law by the Legislature of 1903 to amend the act under which it was provided that sheep killed by dogs should be paid for from the dog tax fund of the county, in such a manner as to permit payments to be made for other domestic animals bitten by a rabid dog and destroyed or necessary to be destroyed by reason thereof, has been productive of much benefit. In particular, this act had the effect of bringing more definitely to the attention of dog owners the necessity for taking such precautions as are recommended for the control of rabies.

The practice of the State Livestock Sanitary Board with regard to the control of rabies is to quarantine the dogs that are known to have been exposed or that may have been exposed to contact with the rabid dog, or if these animals cannot be located then to quarantine all of the dogs in the district known or believed to have been traversed by the rabid dog. This quarantine is usually placed for a period of 100 days. It requires that during its operation, all dogs within the quarantined district shall be muzzled with a close muzzle that will effectively prevent biting, or that they shall be confined. When the quarantine notice is violated, and when dogs are permitted to run at large within the quarantined area without muzzles, such dogs may be shot or otherwise destroyed and their owners have no claim against the person so doing. This provision is necessary because ownerless dogs are of course unmuzzled and unconfined whether they originate within the quarantined district or whether they stray from without. Furthermore, dogs are not always under the control of their owners, and as it is not customary

for the name plate of the owner to be attached to the dog's collar. there is no means, in many cases, of determining the ownership of dogs running at large in violation of the quarantine, and so a penalty applied to the dog is the only one that is possible. Where the owner of a dog permitted to run at large in violation of the quarantine can be identified, action may be brought against such person, who may be fined not more than one hundred dollars.

It is important that dog owners generally shall be impressed with the fact that ownership of dogs carries with it a certain responsibility, and certain duties to the community. It would be well if the dog tax were more equitably assessed than it is. A large advantage would accrue from a requirement to the effect that all dogs should be provided with collars bearing a metal plate with the name and address of the owners. If such requirements were enforced the responsibility for the damage done by uncontrolled dogs could then more definitely be placed where it belongs: upon the owners of such animals.

Many efforts have been made to secure the enactment of suitable legislation governing dogs. Some legislation to free the State from a great excess of ownerless and worthless curs is greatly needed, both in the interests of the live stock industry, and especially of sheep husbandry, and of the public health.

Mange of horses. This disease has occurred during the year 1907 in the following counties: Berks, Clearfield, McKean, Monroe, Philadelphia and York. In an outbreak in Berks county, fourteen horses afflicted with mange died. The disease in this case was not reported until after it had been in existence for a long time and had been very ineffectively handled. The cure of mange is not a difficult matter, provided the treatment is inaugurated promptly and is carried out faithfully. The best remedy that we have used for this disease is the lime and sulphur wash, such as is used for sheep scab. Directions for making this wash were furnished in the report for last year. The outbreaks of mange that have been observed in this State have been among horses from the West or among horses exposed to contact with mangy horses from the West. No cases of mange are known to exist among horses in any part of the State at the present time.

Tuberculosis. The method for the control of tuberculosis and the general principles adopted by the State Livestock Sanitary Board for dealing with this disease have already been discussed in the preliminary part of this report. During the past year, the Board was asked to make inspection of a great many more herds than it was possible to inspect with the means provided. Where a complete inspection, depending upon the use of tuberculin, cannot be made, it is customary to make a physical examination of the herd for the purpose of detecting any animals that may be afflicted with advanced or generalized tuberculosis or with tuberculosis of the udder. During the year, it has been necessary to condemn 1,352 tuberculous cattle from 773 herds.

While progress is being made in the repression of tuberculosis of cattle, the disease is so very widespread and affects such a great number of animals that advancement is necessarily slower than in the case of a less prevalent malady. The continuing of the work as it is being conducted now will lead to the gradual restriction of this

disease. It is hoped, however, that more rapid progress may be made by the use of vaccination, by the method that has been developed by the experimental work of this Board. The need for the repression of tuberculosis is two-fold. In the first place, the disease is a very widespread affection of cattle and destroys great quantities of property every year. In this way, breeders are discouraged in the keeping of high-priced animals and the improvement of the average quality of the live stock of the State is retarded. In the second place, tuberculosis is of importance with relation to public health. This subject has been discussed considerably of late and, believing it to be of interest, I shall briefly review some of the leading facts that have been brought forward and especially some of those that have been developed recently that throw light on this question.

This subject is one with regard to which the greatest possible differences of opinion have prevailed. Is tuberculosis of cattle transmissible to man and, if so, to what extent is the milk of tuberculous cows harmful?

In answer to these questions Koch has said: "I should estimate the extent of infection by the milk and flesh of tuberculous cattle, and by the butter made from their milk, as hardly greater than that of hereditary transmission, and I therefore do not deem it advisable to take any measures against it." On the other hand, von Behring has recently said: "The infants' milk is the chief source of tuberculosis infection." These are the extreme views on this subject.

Is it true that the milk of tuberculous cows is of so little importance to public health that no action on this subject is necessary, or is the truth, perhaps, to be found somewhere between these extreme views?

A dogmatic answer to these questions can be of no value. The situation is to be cleared up not by opinion, but by facts. It does not seem so strange that such different views prevail in regard to tuberculosis when we consider how recent is our knowledge of this disease. While some exceptionally clear sighted individuals recognized tuberculosis to be a contagious disease in olden times, it was not generally so considered, even by the most advanced medical thinkers, until after the epoch making experiments of the French investigator, Villemin, in 1865. These experiments proved that tuberculosis may be transmitted by inoculation from animal to animal and from man to animal, they demonstrated the infectious nature of the disease and were accepted as proving the identity of human and animal tuberculosis. This work was repeated and confirmed by numerous pathologists in different countries and especially by Chauveau (1868), Gerlach (1869), Bollinger, Klebs and Cohnheim.

The unity of the different forms of tuberculosis of mammals was regarded as fully proven when, in 1882, Koch discovered the tubercle bacillus and established the fact that this germ is the cause of tuberculosis and that there can be no tuberculosis without the presence of the tubercle bacillus. This discovery placed the study of tuberculosis on an entirely new plane and there was a general agreement to the effect that tuberculosis of man and of the higher animals is one disease until, in 1898, Theobald Smith discovered

certain difference between a culture of tubercle bacilli from a cow and another culture believed to be of human origin. These differences consisted in minute variation in size and shape, in some slight, although well marked, differences in growth upon artificial culture media and, most strikingly and most constantly, in differences in virulence for cattle. It was shown by Smith and also by Frothingham, Binwiddie, Ravenel and de Schweinitz that, while cultures of tubercle bacilli from cattle afflicted with tuberculosis are, almost invariably, capable of producing progressive tuberculous disease when inoculated upon cattle that, on the other hand, cultures of tubercle bacilli from man are usually not virulent for cattle; that is to say, when inoculated upon cattle they produce either no effect or merely local disease.

This especial subject received a great deal of attention at the laboratory of the State Livestock Sanitary Board during a period of five years. A large number of experiments were instituted for the purpose of comparing tubercle bacilli from man and from cattle. It was found that tubercle bacilli from cattle are at least as virulent and generally very much more virulent, than tubercle bacilli from man for experimental animals including herbivora, carnivora, omnivora and also monkeys of several species.

This development in the study of tubercle bacilli from different mammals, which had taken place almost entirely in America and which was just becoming generally known, was brought vividly to the attention of the whole world in 1901, by Koch, who, in a paper before the British Congress on Tuberculosis, made the statement that I have already quoted, to the effect that bovine tuberculosis is of such slight importance to the public health that no action need be taken regarding it. In our effort to come to a just decision in this matter, it is necessary to analyze briefly the facts upon which Koch's opinion was based.

Koch had found by experimentation that American investigators, following the lead of Theobald Smith, were correct in their conclusions to the effect that tubercle bacilli from cattle are usually much more virulent for experimental animals than are tubercle bacilli from man. He was so impressed by this fact that he came to regard tuberculosis of man and cattle as distinctly different types of disease. It had been shown that human tuberculosis cannot, in most cases, be transmitted to cattle, and so he concluded that the converse must be true and that bovine tuberculosis cannot be transmitted to man. It does not seem that this inference can fairly be drawn from the established facts that the chief and most striking difference between human and bovine tubercle bacilli lies in the fact that the bovine germ is very much more virulent than that from man, so that while most human tubercle bacilli are incapable of causing disease in experimental animals of several kinds, there is no experimental animal (mammal) that is able to resist infection by the bovine germs. So far, then, as this point is concerned, it would appear that the demonstration of the extreme virulence of the bovine tubercle bacillus would point quite as clearly to more danger to mankind than had formerly been attributed to this germ, than to lessened probability of danger.

Another point that we must consider, that was made by Koch in his London address, is with regard to infection of the human

subject by way of the digestive tract. Koch called attention to the fact that when tuberculosis is carried from cattle to mankind, it is through the food and especially through the milk, for meat is usually cooked enough to destroy tubercle bacilli, if any should be present. This being the case, he concluded that when coming from cattle, the disease should originate in the victim as a primary intestinal tuberculosis. Koch seems to have had the opinion that in cases of food infection, the only, or at any rate the chief, lesions should involve the intestines. He calls attention to the reports of the Charité Hospital in Berlin showing that, in a great mass of material but ten cases of primary tuberculosis of the intestines occurred in five years, and also that among 933 cases of tuberculosis in children Baginsky never found tuberculosis of the intestines without simultaneous disease of the lungs and the bronchial glands.

With reference to this point, it may be said that the cases admitted as primary intestinal tuberculosis under Koch's very rigid interpretation of this term, do not furnish any evidence whatever as to the frequency with which infection occurs through the digestive tract. It has been shown that tubercle bacilli may pass through the wall of the intestines and enter the blood system by way of the thoracic duct without causing any visible alteration in the intestinal wall. Indeed, when animals are artificially infected with tuberculosis by feeding them tuberculous material, it is very rare to find ulceration of the intestine, or tubercles in the walls of the intestines, unless an excessive quantity of infectious material has been fed.

It has happened in some carefully conducted experiments that animals infected by feeding have, after death, shown extensive tuberculosis of the lungs and very little disease, indeed sometimes no trace of disease, in the organs of the abdominal cavity.

A third point made by Koch in the address referred to, is stated in these words: "Hitherto, nobody could decide with certainty in such a case whether tuberculosis of the intestine was of human or of bovine origin. Now we can diagnose them. All that is necessary is to cultivate in pure culture the tubercle bacilli found in the tubercular material, and to ascertain whether they belong to bovine tuberculosis by inoculating cattle with them." In this view, Koch is in accord with Smith, who holds that the type of the bovine tubercle bacillus is so fixed that it is not lost through growing in the human subject, so that after the death of such subject, the germ may still be recognized as of bovine origin, and the surest test for this is to determine whether it is capable of producing disease in a calf.

Since 1901, a very great amount of fruitful study by leading bacteriologists has been devoted to this particular problem. The State Livestock Sanitary Board has always held a leading position in these investigations. It is clearly established that tubercle bacilli as they occur in mammals may be divided into two varieties or types; the bovine type, which grows slowly in artificial cultures, which is relatively thick and short and which is highly virulent for rabbits, cattle and all other mammals; and the human type, which grows more readily in artificial cultures, is slightly longer, more slender, is more inclined to be beaded and which is but slightly virulent for rabbits and cattle and is of lower virulence than the tubercle

bacillus of bovine type for all other animals, excepting, possibly, for the extremely susceptible guinea pig.

Let us look for the cause of this difference. Every living object is influenced by its environment; its habits of growth and its characteristics are determined to a great extent by the conditions to which it is subjected. When a living organism inhabits the tissues on another living being, it is known as a parasite. The tubercle bacillus is a parasite and has lived a parasitic existence so long that it is now incapable of growing under natural conditions outside of the living body. If it is propagated, during a long period, from one animal to another, of the same species, it must develop certain characteristics expressive of the influence of its long continued and unchanging environment.

Tubercle bacilli as they affect mammals, are propagated chiefly in the bodies of human beings and of cattle. While the disease affects animals of other species and, indeed, no warm blooded animal is wholly exempt, tuberculosis is not propagated continuously in animals of any other species than the two just referred to. For example, tuberculosis is in some regions very common among swine. But it is always possible to show that the prevalence of tuberculosis among swine is in proportion to the amount of milk they eat and to the prevalence of tuberculosis among the cows that produce this milk. Tuberculosis of swine is most prevalent where they are fed on skimmed milk from creameries in districts where there is most tuberculosis among the dairy herds. This disease is but rarely transmitted from swine to swine. Tuberculosis of horses occurs where there is much tuberculosis of cattle and where it is the practice, as was formerly the case in Denmark, and to a less extent in England, to feed a certain amount of cow's milk to foals and to horses out of condition. I know of no case where there has been reason to believe that tuberculosis has been transmitted from one horse to another. Tuberculosis of dogs and of cats is sometimes contracted from cattle through feeding upon infectious milk or upon the organs of animals afflicted with tuberculosis, as at a slaughter house; or pet dogs and cats kept in the house, may contract tuberculosis from their consumptive masters. Tuberculosis of all other mammals may likewise be traced to a bovine or human course.

Thus it is, that there are two main branches or streams of mammalian tubercle bacilli, one following its course through the bodies of consumptive people and the other through the bodies of consumptive cattle, and each giving off side branches to animals of other species; but these secondary branches terminate within a generation or two after leaving one of the main stems, while the principal currents continue to flow through the bodies of men and of cattle, on and on, as they have done for centuries, leaving broad swaths of dead and dying victims. This continuation of tubercle bacilli in one line or the other has produced the definite characteristics that have been mentioned as the distinguishing features of the human and bovine type of this germ.

The important question from a public standpoint is: Are the germs of bovine tuberculosis capable of producing disease in man? This question can now be approached in a new and enlightening way. Formerly the attempt was constantly made to decide the question as to the transmissibility from cattle to man by what might be

termed clinical observation. Numerous cases were recorded to show that people had become infected with tuberculosis from cattle, through wounds upon the hands. Some of these cases appear to lack none of the accuracy of a deliberately planned scientific experiment, the possible sources of error having been so carefully excluded. There are also numerous cases of record which are believed to show that tuberculosis has been conveyed through milk from cows to children. Some of these observations appear to have been made with such care and completeness as to exclude all probability of error. For example, I am personally familiar with the following case: A young couple shortly after marriage moved into an entirely new house, in which their first child was born. The parents were thoroughly healthy, rugged people, entirely free from the slightest suspicion of consumption and, so far as known, there was no taint of consumption in the family of either. The single servant was a healthy young person. The child, which was fed on the milk of one cow, died of tuberculosis when about eight months old. Attention was then directed to the cow and it was found that she was rather extensively tuberculous.

Those who oppose the view that tuberculosis may be transmitted from the bovine to the human subject call attention to the possibility of error in all of the great number of observations similar to the one that I have just given. Their criticism is that such observations do not prove that a child was infected through the milk unless all other possible sources of infection are rigidly excluded. They say that the child may have contracted tuberculosis from a human subject through some unseen and unsuspected channel, that the germ may have been brought into the house by the grocer's boy or by the baker or upon the hem of the skirt of a visitor. Such possibilities must be admitted, but it cannot destroy the conclusion that is usually drawn from these observations.

If we assume, merely for the sake of argument, that 10 per cent. of the tuberculosis of childhood is derived from cattle, it should not be in the least surprising, in view of the extent to which consumption prevails, and in view of the long time usually required for its development, the months or years that may elapse from the time that the infection is acquired until the first symptoms of illness appear, that the route of passage of infection from the cow to the baby should be unrecognized and unobserved. That this observation should not be made is still less surprising in view of the fact that for centuries tuberculosis has been passing from one person to another, and is chiefly propagated in this way, but it is only in the most recent times, that this essential fact has been recognized. Even now, there are a few unconvinced persons who deny it.

The recent great additions to our knowledge of the bacteriology of tuberculosis, which have made it possible to distinguish the bovine from the human type of tubercle bacillus, have made it possible to obtain exact and convincing evidence as to whether the bovine bacillus is capable of causing disease in the human subject. Koch recognized this point, as Smith had before him, and suggested that experiments be made to determine just how often people are infected by the bovine bacillus, the possibility of which he did not deny, although he regarded such infection as exceedingly rare. Studies on this point have been made in nearly all civilized countries

and they show that the bovine bacillus is the cause of a varying amount of disease. Of six fatal cases of tuberculosis of children studied bacteriologically by Ravenel in Philadelphia, three were found to be infected with a tubercle bacillus of the bovine type.

Similar studies have been made by a great many individuals, by an English Royal Commission and by a Committee of Investigators appointed by the Imperial Health Office of Germany. These investigations have shown beyond question that tuberculosis of man may be caused by the tubercle bacilli of the bovine type. The proportion of the cases in which this germ is found carries considerably; of the German cases one-seventh and of the English cases about one-third were caused by bacilli of bovine type. *It must be remembered, however, that the number of studies that have been made in this direction is not yet sufficient to justify one in drawing any conclusions as to the actual frequency of the infection of the human being with bovine tubercle bacilli.* The clearly established and important point is that the same kind of tubercle bacillus that produces disease in cattle may also produce disease in man. Upon this point there appears to be no room for difference of opinion.

Abortion. This widespread scourge of breeding herds has been less complained of during the past year than during preceding years. Reports of the occurrence of abortion and the requests for advice are met by furnishing a circular as printed in the report for 1904, giving instructions for treating this disease and by furnishing additional special information as may be needed. Herd owners are learning that loss from this disease is not unavoidable and that it may be prevented at comparatively small cost, excepting the watchfulness and the work that are necessary to single out the afflicted animals and administer to them the required treatment; in other words, instead of accepting losses from this disease, and instead of becoming completely discouraged and selling herds afflicted with abortion and thus spreading the disease widely, it has become the custom to treat afflicted animals in accordance with the instructions furnished, and in this way they are saved.

Actinomycosis. This disease, commonly known as "lumpy jaw," is caused by a fungus of the genus *Actinomyces*, that is believed to grow upon vegetation and to infect cattle from their food. The disease is not known to be directly transmissible by contact, as between members of a herd. On this account, actinomycosis has never been dealt with by quarantine, appraisement and condemnation as virulent infectious diseases are dealt with. The Board is, however, frequently requested to take action with regard to this disease. Such requests come not only from the owners of afflicted animals, but also from neighbors of such owners and representatives of local boards of health. While there is no evidence to indicate that the organism that causes actinomycosis may be excreted through the milk, unless the udder is involved in this disease, as occurs excessively rarely, still it is well to follow the general principle that only healthy animals shall be used for the production of milk for human consumption. The best way of disposing of animals afflicted with actinomycosis, if they are in fair condition of flesh, is to slaughter them in a slaughter house subject to inspection by a veterinarian. If the disease is confined wholly to the jaw or head, the head must be condemned, but it is not necessary in such cases to

condemn the other parts of the carcass. If, however, the disease is generalized or if it has extended to the lungs, then the entire carcass should be condemned. No provision has been made by the State Livestock Sanitary Board for the payment of compensation for animals killed on account of this disease.

Poisoning. The State Veterinarian is often consulted with regard to cases wherein animals are poisoned or are believed to have been poisoned. Such poisonings are in some cases accidental and in other cases malicious. The diagnosis of poison, and especially in the case of an animal that has been dead several days, must depend upon a chemical analysis. The laboratory of the State Livestock Sanitary Board is not equipped to do chemical work of this nature and so it has not been possible to respond to a large number of requests to analyze organs or stomach contents from animals believed to have been poisoned. Moreover, it does not appear that work of this kind is within the scope of the work that the Legislature intended the State Livestock Sanitary Board to do. Reference is made to this point in order to make it clear that chemical work of this nature cannot be performed in the laboratory of the State Livestock Sanitary Board.

Texas fever. But two cases of Texas fever were reported during the year. In one case the afflicted animal was a steer that had recently been brought into the State, and in the other case it was a yak that had been shipped from the south.

Other diseases: Cow-pox, calf cholera, forage poisoning, parasitic diseases, diseases of fowls, etc., have shown no unusual features during the past year. All of these and many other subjects have been discussed through correspondence with interested persons. Diagnoses of these diseases have been made in many instances, and such action as has been necessary to prevent the spread of infection has been taken, and advice has been furnished looking toward prevention.

Respectfully submitted,

LEONARD PEARSON,

State Veterinarian

REPORT OF THE ECONOMIC ZOOLOGIST.

HARRISBURG, PA., *January 1, 1906.*Hon. N. B. Critchfield, *Secretary of Agriculture, Harrisburg, Pa.:*

Sir: I have the honor to submit to you the Annual Report of the Division of Zoology for the year 1905. As I endorse the words expressed by President Roosevelt to the various departments of the United States government in stating that an Annual Report should be a business-like statement and definite account of the business of the Department which is under consideration, and should not contain new educational nor scientific material, but a resumé of what had been accomplished, I offer the following. My justification for this lies in the fact that our Bulletins, both periodical and special, have given us a fair avenue of publication, and the law permits several times as many of these to be printed as Annual Reports. Therefore, the results of our investigations and experiments which should be published in detail and made practical will reach more persons who need them when published in Bulletins than when published in the form of a report.

In our Monthly Bulletin for May, 1903, Vol. I, No. 1, we announced that among our important undertakings would be the following:

1. Examining specimens and answering questions sent us.
2. Personal work: Investigation and experimentation.
3. Publication.
4. Lectures.
5. Inspection of nurseries and private premises.
6. Inspection of imported plants, seeds and fruits.
7. Making collections.

1. SPECIMENS SENT.

During the past year we have made many accessions to the collections, and while most of these have been collected by our own collectors and representatives from this office, a great many of them have been contributed by persons in various parts of the State, especially noticeable among the donations is a collection of mounted birds and mammals by Dr. M. W. Raub, of Lancaster, and a very large, remarkably handsome and well prepared collection of insects by the same gentleman, which has been bequeathed to us on the one condition that we take proper care of it and use it in advancing the work in which we are engaged. Other persons making donations are Rev. M. Wirtner, of Jeannette, Pa., who donated a large and carefully prepared collection of the Heteroptera or "True Bugs" of Western Pennsylvania; Mr. George, of York, Pa., donated a collection of mounted birds and mammals prepared by himself; Mr. D. C. Heim, of Sunbury, Pa., who contributed a valuable collection of butterflies from his region; Prof. C. F. Laurie, of the Erie

Museum, who donated a collection of insects as well as many reptiles and other specimens; Prof. L. W. Mengel, of Reading, Pa., who has contributed prepared collections of Lepidoptera (Moths and Butterflies); Mr. R. Simpson, of Warren, Pa., who has donated a large collection of mammals and birds of the northern faunal area, collected in Warren county, and Mr. Klages, of the Carnegie Museum, who contributed a large collection of pinned and labeled Coleoptera or Beetles from Western Pennsylvania, besides a great many contributors of highly-prized and valued material in less amount from practically every county in the State. Since last September these contributions have been acknowledged in our Monthly Bulletins, and it would take more than twenty-five pages of this Report to enumerate the specimens sent, together with the contributors of the same. It is enough for us to say that all of these are valuable, and there surely has never been any state in the Union nor any country in the world that has given any naturalist such remarkable support in his collection of specimens as we have received from our citizens during the past year. They have awakened to the importance of this work and see that they will receive the benefits of it in proportion to what they do to help it develop.

Of course, many of these specimens have been insects, either directly injurious or supposed to be obnoxious. In such cases senders have asked for information concerning them, and especially have desired knowledge of the methods of preserving their property from their attacks. Chief among such insects have been the San José Scale and several other kinds of scale insects, such as oyster-shell, scurfy and Lecanium, but the canker worm has been important in this State and has received attention, as well as the root maggots of cabbage and radishes, caterpillars of shade trees, insects in mills and buildings, particularly the Mediterranean flour moth, granary pests, household pests, and numerous others that are to be learned by looking over the lists of acknowledgments in our Bulletins.

2. INVESTIGATIONS.

The investigations of this office have been chiefly along economic lines, as we have believed that it is necessary first to make a careful study of those objects that are of economic value or bearing and thus prepare our citizens to see the value of what may appear of non-economic importance, and which may later prove to be of greater value than they have supposed. We have finished investigations on the Hessian Fly, mentioned in a previous report, and have made a prolonged study of the San José Scale and the various methods of controlling the same, experimenting with summer remedies as well as winter, and with commercial insecticides as well as with home-made remedies, and our final conclusions are to be summed up in the statement that *the Lime-sulphur-salt wash, boiled for one hour, and applied while the leaves are off the trees or when the trees are dormant, is positively the best means of killing the San Jose Scale, the safest or least injurious to the infested trees, and the least expensive material that can be effectively applied for this pest.* There have, of course, been a great many commercial materials placed on the market, and our tests of these have proven their inefficiency in comparison with the standard remedy mentioned above, which is

universally approved by the scientists and most of the practical men of the country.

Our investigations of the Oyster-shell Scale and the Scurfy Scale have given us the full life histories of these pests in this State, showing that they have two broods per year, one appearing about the middle of May and the other about the first of August or sometimes earlier, and as these are dates when the young free-moving pests are crawling about and are very delicate, they are consequently the periods when spraying for these pests will be most effective, since spraying for them in the winter when they are in the egg stage and better protected has not proven as satisfactory as for the San José Scale at the same time. We have had fair success with the lime-sulphur-salt wash in early spring for Scurfy Scale, but not for the Oyster-shell.

Our studies of the food of birds have been continued, and we are at this time working on the food of blackbirds and crows, having much proof that the latter feed on insects all year, even during the winter months. We have found in their stomachs such injurious insects as the Red-legged Grasshopper, the Clover-leaf Weevils and other pests. Our investigations of the food of Batrachians, or frogs, toads and salamanders have proven the great value of these creatures as insect destroyers, and also that they do not eat many beneficial insects and do not have any obnoxious habits in destroying the property of mankind or in any other way. A Bulletin on these lowly forms of Vertebrate Animals is in course of preparation and will be issued during the coming year.

Considerable attention has been given to the Reptiles of Pennsylvania. Collections have been made as far as time will permit, and the food of these reptiles has been carefully studied. This has resulted in new knowledge concerning many of them, and has proven that the Garter Snake, which was supposed to be mostly insectivorous and consequently very valuable about the premises, feeds to a great extent upon toads and frogs, and as these amphibians are among the most valuable of insect destroyers of the farm, the Garter Snake becomes obnoxious and objectionable in its economic aspect. On the other hand the two forms of Blacksnakes, known as the Blue Racer and Pilot, are proven to feed during the early part of the summer upon birds' eggs and young birds, and thus are objectionable, while from the middle of the summer until the hibernating season they feed mostly on rodents, such as rats and mice, and thus become very beneficial in their economic relations to mankind. Several snakes, such as the Hognosed Adder or Spreading Adder, Blowing Viper, Copperheads and Rattlesnakes, feed to a great extent upon large caterpillars, and where these insects occur upon the ground they are certainly held in check by such serpents. Were it not for the poisonous effects of the Rattlesnakes and Copperheads they could well be protected on account of their beneficial feeding habits. A Bulletin on this subject is in the course of preparation and will be issued soon.

We have investigated the habits of the Canker Worms that have been so destructive during the past two years in the central and western portions of our State, and have published that they are the Spring Canker Worms (*Paleacrita vernata*), of which the females climb the trees early in the spring, generally in the latter part of

March, and deposit their eggs in bands on the twigs where they hatch and feed on the green leaves as soon as these appear, and reach their maturity during the early part of June. They then suddenly disappear by going into the soil and remain there until the last of March. We have published the experiments with these pests and have proven that they are to be prevented from climbing the trees by sticky bands, such as can be made of castor oil and rosin, equal parts, boiled together, or other mechanical bands will be mentioned in our Bulletin for March, 1906.

Root worms in cabbage, radishes, etc., have been very destructive in this State and our investigations and recent experiments with these pests were published in our Bulletins of last summer and also will be in April, 1906. However, further study of this important subject is needed and will be conducted during the coming season.

Among our important investigations have been the studies of parasites of particular specimens reared in our breeding cages. During the year we have maintained over four hundred cages of living insects, such as are known among entomologists as "breeding cages," and we have reared or fed them, in many cases, from the egg to the adult in order to study the entire life cycle, and of course, many of the insects which were collected as larvæ out-of-doors have given us parasites of those species which are beneficial in holding them in check. We have so much material upon this important subject that we hope to prepare a Bulletin on the parasites which our breeding cages have given us. This work is the most strictly scientific feature of our office work, and the results have been very gratifying. Detailed notes have been kept, so that as the months go by their value increases by their growth. Our greatest need is an insectary, or room constructed like a green house, for rearing specimens.

All of our field demonstrators and experimentors and all persons connected with the office who have made any collections or observations either for personal recreation or for direct studies have kept careful field notes and these are of great use in our office. As they include different subjects it will in the future become easier for us to write upon them in a comprehensive manner, and the writings will be of greater value because increased by the notes on observations of different seasons and years.

Among our experiments those of chief interest have been with the San José Scale. We have made experiments to determine the time of year to spray to control this very destructive pest and have proven it to be during the dormant season or when the leaves are off the trees. Summer washes had to be applied as many as fourteen times, at intervals of but a few days each, to kill all the young scale insects as they appeared in succession and to exhaust the reproductive capacity of the female without destroying the leaves of the trees. The adult or mature San José Scale is so difficult to kill that summer applications that will not injure the foliage will not hurt it. For that reason summer sprays, excepting to check this insect where it is very abundant, are not advisable. Experiments were also made to determine the proper time to boil the Lime-sulphur-salt wash, and we have proven that it must be boiled at least one hour to get the best results, regardless of the color of it, and the length of time is also to depend upon the different qualities of lime that are used, as magnesium carbonate requires a little longer

boiling than calcium carbonate. Other experiments have been performed with variations of the methods of making the lime-sulphur washes and keeping the same different lengths of time after they were made. Also a few experiments were made with the various commercial insecticides, as indicated above, and nearly all of these have been published in our Monthly Bulletins, but we now have such a complete series of facts bearing on the San José Scale in this State, and such a certain method of controlling the same, that we are encouraged to put these together in the form of a Special Bulletin on the "San José Scale," which will be issued during the summer of 1906.

Last summer experiments were conducted for Potato Blight and Potato Beetles, using various kinds of fungicides and insecticides, and especially a preparation sold on the market known as "Bug Death." Our experiments proved conclusively that this latter material is useless and not effective, and is not to be regarded as good either for Blight or Beetles, as is the standard remedy of Paris Green and Bordeaux Mixture.

Experiments on Cabbage Root Worms and other root worms of Cruciferous plants showed that carbolic emulsion applied early is one of the best remedies and possibly also preventives of this pest.

Experiments were performed with Melon pests, both Blight and Insects, and it was found that the Blight is readily controlled by early applications of Bordeaux Mixture, and Beetles can be killed by adding either arsenate of lead or a good quality of Paris Green to the Bordeaux. The Melon Beetles are also repelled by dusting with ashes and coal oil.

Experiments were carried on for the Peach-tree Borer with a new insecticide which we used in this State for the first time. This consists of nothing but one ounce of concentrated lye in each gallon of boiling water, and a quart of this mixture poured over the trunk of the tree one foot above the root after the mass of gum has been cleared away with a hoe. This will kill the Peach-tree Borers and prevent the necessity of cutting them out. It is the best and cheapest means of combatting this pest that has ever been proposed.

Experiments with the Plum Curculio were begun late, but we had some very valuable results in spraying with arsenate of lead, which proved a valuable means of preventing loss by this pest. This material, in proportion of three pounds of arsenate in one hundred gallons of water, gave surprising results. Ninety per cent. more plums dropped off unsprayed trees than from those that were sprayed. Nearly all the experiments and investigations mentioned are published in detail in our Bulletins and these notes are here offered merely as a resumé of some of the important work we have accomplished.

3. PUBLICATIONS.

The publications of this office have been the Monthly Bulletin of the Division of Zoology, (2) the Zoological Quarterly Bulletin, (3) Special Bulletins and (4) Special Newspaper Articles.

We have averaged more than one and one-half pages of printed matter per day during the past three years. However, the correspondence and other work of the office became so imperative through

its unprecedented growth that as a matter of saving of both time and money we ceased the publication of the *Quarterly Bulletins* last summer, after issuing Vol. 1 of No. III, in May. These *Bulletins* were devoted mostly to Birds or other Vertebrates, and such material as was intended for them will be published in certain numbers of the *Monthly Bulletins*.

Among the *Special Bulletins* we have nearly completed is one upon "Bees and Bee-Keeping," and another upon the "San José Scale." Special newspaper articles have pertained mostly to scale insects, canker worms, cidasas or the seventeen-year locusts, cut worms, and such other pests and diseases of plants as were proving especially important at certain times during the year in different parts of the State.

4. LECTURES.

During the past year the Economic Zoologist has delivered lectures at different places along the lines of the work of the office, and more recently some of this work has been done by Mr. N. G. Miller, Assistant Economic Zoologist. The number of such lectures given during the past year has been about as follows: At Farmers' Institutes, 32; at Teachers' Institutes, 21; at Farmers' Clubs, 4; at Horticultural Societies, 8; at Granges, 15; at Alliances, 1; at Natural History Societies, 5; before schools, 7; at public agricultural meetings, about 25, besides over 200 addresses in different parts of the State, chiefly upon the San José Scale and allied insects, by our demonstrators and inspectors.

6. INSPECTIONS AND DEMONSTRATIONS.

A. Inspection of Nurseries.

The nurseries of Pennsylvania are of vast importance. Not only do we grow many more fruit trees than are needed for home use, but in the nurseries of this Commonwealth is grown most of the ornamental stock sold in the eastern part of the United States.

We have a very effectual system of Nursery Inspection, which is proven by the fact that the number of nurseries in which the San José Scale occurred, as found by the State Inspector, has steadily decreased.

However, it is very desirable that our nurseries, and thus, indirectly, the young orchards of our entire State, should be protected by legislation providing against constant re-infestation from adjoining orchards.

The State Nurserymen's Association has been organized to meet this and other important conditions. All nurserymen are invited to become members and profit by it. (Write to the Secretary, Mr. Earl Peters, Mt. Holly Springs, Pa.)

The following list of nurserymen growing stock in Pennsylvania is complete, as far as we are able to determine. If any person knows of other nurseries in Pennsylvania please notify this office at once. All in this list have been inspected and all have certificates permitting them to make sales, according to law, excepting those marked (†), whose certificates are pending. Those marked (*), do not grow and sell trees, but berry bushes and plants only. This list does not indicate where San José Scale was found, but shows who have certificates and who have not.

LICENSED NURSERYMEN IN PENNSYLVANIA.

Adams County.

Name.	Place.	Acres.
M. E. Hartman,	Arendtsville,	2
†A. D. Taylor,	Biglersville,	4
R. M. Elden,	Aspers,	3
W. S. Adams,	Bendersville,	1
Jere Taylor,	Bendersville,	1½
†O. P. House,	Bendersville,	4
A. S. Wright,	Bendersville,	3
†B. F. Wilson,	Biglersville,	2
†Bream & Hartman,	Cashtown,	2
J. M. Hare,	Fairfield,	1
C. L. Longsdorf,	Floradale,	3
Storrick & Hartman,	Gettysburg,	1
†H. M. Horner,	Gettysburg,	1⅔
C. A. & J. E. Stoner,	Gettysburg,	10
Cornelius Bender,	Idaville,	1½
H. W. Sowers,	Latimore,	1½
Charles J. Wilson,	Mummasburg,	4
Mrs. G. P. Weaver,	New Oxford,	1½
W. E. Grove,	York Springs,	16
H. R. Plank,	York Springs,	3
William Williams,	York Springs,	1

Allegheny County.

J. B. Murdock & Co.,	Pittsburg,	2
Elliot Nursery Co.,	Springdale,	33
G. R. Elliot,	Westview,	1
Mark E. Head,	Bellevue,	1½

Beaver County.

Mackall Bros.,	Beaver,	20
*James Smith,	Beaver Falls,	6
A. P. Goodwin,	Industry,	12
*J. Hoyt,	Industry,	20
*Henry Finley,	Industry,	6
*A. J. Freed,	Homewood,	12
*Fred A. Russell,	Industry,	1
*W. A. Freed,	Homewood,	5

Bedford County.

Austin Wright,	Alum Bank,	2
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Butler County.

Pierce Bros.,	Butler,	10
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Blair County.

I. N. Kemp,	East Freedom,	3
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Bucks County.

J. L. Lovett,	Emilie,	10
Somerton Nurseries, 125 S. 5th St., Phila., A. U. Bannard, Mgr.,	Somerton,	20
Henry Palmer,	Langhorne,	4
Horace Janney,	Newton,	5
D. Landreth Seed Co.,	Bristol,	10
The W. H. Moon Co.,	Morrisville,	250
S. C. Moon Co.,	Morrisville,	50
J. G. Youngken,	Richlandtown,	1
S. R. Trach, R. D. No. 1,	Springtown,	1

*Grow berry, or small fruit plants only.
†Certificates pending.

Chester County.

Name.	Place.	Acres.
George Achelis,	West Chester,	200
The Conard & Jones Co.,	Westgrove,	4
The Dingee & Conard Co.,	Westgrove,	4
Rakestraw & Pyle,	Kennett Square,	150
J. A. Roberts,	Malvern,	16
Hoopes Bros. & Thomas,	West Chester,	600
J. B. Reif,	Spring City,	2
J. K. Miller,	Parkerford,	$\frac{1}{2}$
Benj. Connell,	Westgrove,	2

Clearfield County.

†W. S. Wright,	Clearfield,	$\frac{1}{2}$
A. J. Wayman,	Dubois,	$\frac{1}{4}$

Columbia County.

Philip Harris,	Light street,	$2\frac{1}{2}$
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Crawford County.

*M. N. Shepard,	Cochranton,	$\frac{1}{2}$
*J. S. Wood, R. D. No. 59,	Cochranton,	1
*Anderson Bailey, R. D. No. 66,	Cochranton,	15
*Lee Bailey, R. D. No. 66,	Cochranton,	2
*Henry Roberts, R. D. No. 66,	Cochranton,	4
*J. T. Reed, R. D. No. 66,	Cochranton,	2
*David Kelty, R. D. No. 66,	Cochranton,	1
*Park Bailey,	Cochranton,	3
*D. A. Foulk, R. D. No. 66,	Cochranton,	$\frac{1}{2}$
*Samuel Cooper,	Cochranton,	4
*W. H. Braymer,	Cochranton,	1
*Tilden Hart, R. D. No. 66,	Cochranton,	1
*Lewis Swogger, R. D. No. 33,	Carlton,	2
*D. H. Lefever, R. D. No. 2,	Meadville,	1
C. L. Unger, R. D. No. 11,	Meadville,	2
Prudential Orchard Co.,	Shermansville,	26

Cumberland County.

John Peters & Co.,	Mt. Holly Springs,	9
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Dauphin County.

C. P. Scholl,	Fisherville,	8
Snively & Trombine,	Progress,	3
†Rife & Ulrich,	Royalton,	1
J. M. Christman,	Fort Hunter,	$\frac{1}{8}$

Delaware County.

Oak Nursery Co.,	Collingdale,	25
J. J. Styer,	Concordville,	2
M. F. Hannum,	Concordville,	1
W. E. Caum (Lessee),	Haverford,	4
†John G. Gardner,	Villa Nova,	7
F. W. Borneman & Co.,	Lansdowne,	1

Erie County.

*A. F. Youngs,	North East,	5
*Orton Bros.,	North East,	5
L. G. Youngs,	North East,	20
*D. C. Bostwick & Son,	Ripley, N. Y.,	10
C. E. Archibald,	Girard,	1
*J. G. Stephenson,	Platea,	4
*M. E. Kelley,	North East,	2
*A. J. Youngs,	North East,	4
*W. E. Smith,	North East,	3

*Grow berry, or small fruit plants only.

†Certificates pending.

Fayette County.

Name.	Place.	Acres.
J. Sterling & Son,	Masontown,	10

Franklin County.

Byer Bros.,	Chambersburg and Waynesboro,	1
†J. W. Hefflefinger,	Green Village,	6
J. W. Zook,	Chambersburg,	¼

Fulton County.

Eli Covalt,	Covalt,	2
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Juniata County.

*Elmer W. Graybill,	Richfield,	3
Jos. H. Landis,	Collin's Mills,	3
*Augustus Frantz,	Richfield,	1
†W. H. Graybill,	Richfield,	1
*S. H. Graybill,	Richfield,	5

Lackawanna County.

*George H. Colvin,	Dalton,	1
*Floyd H. Northup,	Glenburn,	2
John W. Shepherd,	Scranton,	4
*Elmer E. Richards,	Baldmount,	¼

Lancaster County.

John G. Engle,	Marietta,	6
A. H. Erb,	Lititz,	½
Maurice Brinton,	Christiana,	20
W. P. Bolton,	Bonview,	5
D. D. Herr,	Lancaster,	5
H. H. Harnish,	Hubers,	2
S. R. Hess & Son,	Ephrata,	½
Wilson Kready,	Mt. Joy,	1
†Calvin Cooper,	Bird-in-hand,	2
O. W. Laushey,	Bird-in-hand,	3
A. W. Root & Bro.,	East Petersburg,	23
David Herr,	Mountville,	2
M. H. Musser,	Lancaster,	3
M. A. Kolp,	Elizabethtown,	2
B. F. Barr & Co.,	Lancaster,	3

Lawrence County.

J. W. Hayes, R. D. No. 3,	Edinburg,	1
Butz Bros.,	New Castle,	1
A. S. Moore,	New Castle,	2
D. W. Fisher,	New Wilmington,	2
*Jas. R. Seley,	New Wilmington,	1

Lehigh County.

W. B. K. Johnson,	Allentown,	30
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Luzerne County.

I. A. Driggs,	White Haven,	
(Handles only native ornamental shrubs.)		
M. A. Moffett,	Wilkes-Barre,	1

Lycoming County.

Evenden Bros.,	Williamsport,	2
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*Grow berry, or small fruit plants only.

†Certificates pending.

Mercer County.

Name.	Place.	Acres.
*J. L. Hoobler & Sons, R. D. No. 34, ...	Hadley,	5½
W. A. Taylor, R. D. No. 34,	Hadley,	4
*W. R. Cribbs,	Mercer,	4
*H. W. Allison,	Mercer,	8

Montgomery County.

R. B. Haines & Co.,	Cheltenham,	6
C. H. Wilson,	Gladwyne,	3
J. B. Heckler,	Lansdale,	4
J. W. Thomas & Sons,	King of Prussia,	65
J. Krewson & Sons,	Cheltenham,	12
T. N. Yates & Co.,	North Wales,	100
J. B. Moore,	Hatfield,	5
Adolph Mueller,	Hoyt,	40
T. Meehan & Sons, Inc.,	Dreshertown,	200
†John Reig,	Jenkintown,	6
Wm. Sturtzbecker,	Lansdale,	½

Northampton County.

Theodore Roth,	Nazareth,	2
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Northumberland County.

†Joseph Harris,	Shamokin,	¼
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Perry County.

Wagner & Dewalt,	Alinda,	2
David T. Wagner,	Alinda,	3

Philadelphia County.

W. W. Harper,	Chestnut Hill,	350
Thos. Meehan & Son, Inc.,	Germantown,	65
T. N. Yates & Co.,	Germantown,	4
†Christ Koehler,	Fox Chase,	1
John B. Lewis,	Bustleton,	5
A. F. O'Connell,	Philadelphia,	10
John Stephenson's Son,	Oak Lane,	2

Snyder County.

*J. F. Boyer,	Mt. Pleasant Mills,	7
*F. G. Moyer,	Freeburg,	3
*T. G. Arbogast,	Freeburg,	2

Somerset County.

Village Nurseries,	Harnedsville,	37
H. E. Daniels,	Harnedsville,	7

Susquehanna County.

*E. A. Smith,	Heart Lake,	6
*E. B. Sprout,	Montrose,	4
*Geo. Sprout,	Montrose,	5
*B. D. Hinds,	Montrose,	2
*W. B. Stephens,	Montrose,	1
*E. D. Snyder, R. D. No. 1,	Hopbottom,	1

Venango County.

Venango Nursery Co.,	Franklin,	6
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*Grow berry, or small fruit plants only.

†Certificates pending.

Westmoreland County.

Name.	Place.	Acres.
John McAflams,	Mt. Pleasant,	2

Wyoming County.

*W. H. Swartwood,	Square Top,	5
*Silas Decker,	Square Top,	4½
*F. H. Fassett,	Meshoppen,	1

York County.

Patterson Nursery Co.,	Stewartstown,	10
Geo. E. Stein,	East Prospect,	6
W. S. Newcomer,	Glenrock,	4
J. G. Patterson & Son,	Stewartstown,	12
†Wm. Freed,	Spry,	1
†J. G. Beck,	Yorkhanna,	1

 LICENSED TREE DEALERS AND AGENTS IN PENNSYLVANIA.

According to recent requirements it is necessary for all Tree Dealers and Agents of Nursery Stock, who are not direct representatives of some one nursery only, to procure a License from the Department of Agriculture, which, although free, will be given only to persons dealing with reliable and certified nurseries.

The following have been granted certificates as agents and dealers.

Allegheny County.

Charles Honess, Allegheny, Pa.

Beaver County.

A. E. Crouch, Rochester, Pa.
J. H. Gutermuth, Rochester, Pa.

Bradford County.

Joseph E. Hamilton, R. D. No. 16, Rome, Pa.

Berks County.

Jacob H. Wieand, Reading, Pa.
A. P. Kratz, Silverdale, Pa.

Clinton County.

W. W. Richie, Lock Haven, Pa.

Crawford County.

J. C. Boyd, Guy's Mills, Pa.
Don T. Atkin, Linesville, Pa.

*Grow berry, or small fruit plants only.

†Certificates pending.

Cumberland County.

Ira E. Bigler, Camp Hill, Pa.
D. C. Rupp, Shiremanstown, Pa.

Dauphin County.

A. H. Shreiner, Harrisburg, Pa.
Geo. F. Greenawalt, Hummelstown, Pa.
T. A. Woods, Harrisburg, Pa.
Gilbert Troutman, Millersburg, Pa.

Erie County.

W. S. Waldo, North East, Pa.
E. E. Carr, North East, Pa.

Lackawanna County.

Thos. F. Kane, Scranton, Pa.
Giles L. Clark, Scranton, Pa.
A. J. Noble, Scranton, Pa.

Lebanon County.

Samuel P. Moyer, Myerstown, Pa.

Lehigh County.

N. C. Beachy, Allentown, Pa.

McKean County.

F. S. Palmer, Bradford, Pa.

Northumberland County.

C. H. Weaver, Montandon, Pa.
H. F. Frank, Montandon, Pa.

Schuylkill County.

Walter J. Keller, Pottsville, Pa.
W. O. Snyder, Minersville, Pa.
D. H. Smith, Haas, Pa.

York County.

C. H. Snyder, York, Pa.
J. H. Painter, York, Pa.

B. Inspection of Private Premises and Demonstrations.

During the last year the Legislature made an appropriation for prosecuting the work against the San José Scale and other orchard pests. One of the most difficult problems we have ever had to solve was how to use this in order to give our citizens the best results from it. After due consultation with the Governor and numerous successful fruit growers and others in this State it was decided to send competent men into the different districts of this State to inspect for the San José Scale and other pests and to give demonstrations at intervals of at least five miles, showing how to make and apply the best remedies for this pest.

This work could not be undertaken until fall because the proper remedy to be applied can be used only when the trees are dormant. On the first of November twenty-five men were taken to the State College and given special training concerning the San José Scale and similar pests, and then sent over the State as inspectors and demonstrators. Last fall over 2,000 premises were inspected and scale was detected on more than one-half of them, many owners of which did not know that it was this pest that was causing the death of their trees. During the month of November as well as December, 183 practical orchard demonstrations were given, and over 5,000 persons were present at these public meetings and heard what our representatives had to say and saw the method of saving their trees from this foe. These were nearly all practical fruit growers and immediately prepared to make personal use of the information thus given them. The hundreds of congratulatory letters and remarks that have reached us show that this work has been appreciated and this is, indeed, encouraging. Fruit growers and farmers commenced to order apparatus and spray and save their fruit trees, and this work will result in saving for the citizens of this State, and consequently for the State itself, over one hundred times as much as the cost of the fruits and trees alone, besides the additional effect of better care and protection of other kinds of farm crops, preservation of shade trees and ornamental shrubbery and other good results. This will be more fully outlined in our Bulletin for February, 1906, which interested persons may procure free from this office. This contains details of the methods in this State which are now recognized by the most competent and most successful persons as being the best of any state in the Union. It is a pleasure to know that our efforts to serve the citizens have been crowned with success and are meeting the approval and encouragement we desire, since we are helping them save their property.

Until this year there was no satisfactory legislation applying to the owners of private property, besides nurserymen, compelling slothful or indigent persons to clean up their trees when infested with San José Scale. Thus the orchards of the most careful and active persons were often treated, but the pests on the neglected trees of neighboring premises would reinfest their trees. This has been particularly unjust to the nurserymen because of our stringent and successful efforts to prevent the spread of San José Scale on nursery stock. During the past few months, however, the people of this State, especially the nurserymen, have commenced to take advantage of that legislation which provides that when they notify this Department (in writing) of the probability of scale on adjoining or other premises we must send a man to inspect it and see that it is treated in accordance with the demands of the occasion. Our work is certainly resulting in the control of the San José Scale as well as of other pests, while the expense for this is not great under the present system.

6. INSPECTION OF IMPORTED PLANTS, SEEDS AND FRUITS.

It is especially important that we guard against the introduction of any new pests into this State, and for that reason we are watching shipments of plants, seeds and fruits from other countries. One large shipment from Japan was inspected last spring by our Nursery

Inspector and fortunately no threatening pests were found. There is grave danger of the introduction of the Gypsy Moth into this State, and it is desirable that the United States Congress arrange to make ample provision for placing under the United States Secretary of Agriculture this work, which is of great national importance. The State of Pennsylvania stands ready to act with her sister states and the National Government in quarantining against the spread of such pests. If taken in time it will surely be successful, and through the prevention of loss by additional pests our citizens will be benefited, although they will never know the real value of the scientists in preventing such losses.

7. MAKING COLLECTIONS.

A good, large collection of specimens is necessary for the investigations of this office, and for that reason we are glad to know that provisions have been made not only for an agricultural museum in connection with the Department of Agriculture in the Capitol building, but also for a State museum in the present Executive building after its vacation by the other State officers than the State Librarian, who is to remain in that building. For three years we have been striving earnestly for the establishment of a State museum, and have written several articles advocating this important step for advancing Natural History in behalf of our citizens. Fortunately, Governor Pennypacker saw the importance of this and the last Legislature provided for the establishment of such a museum. While this is not yet organized, attention will no doubt be given to it soon and it will become a very important adjunct to the work of this office.

The collections which we have made have covered the whole realm of zoology from the lowest of the invertebrates to the highest, inclusive, while the chief work has been with the economic species, those which are at present supposed to be non-economic were not neglected. As mentioned before, these specimens are preserved for permanent reference with abundant and accurate notes upon the same, which will be useful for us or other persons at any time in the future in making studies of such subjects. This is the real basis of Natural History investigations in Pennsylvania. It is almost incredible that during the past year this Department has either received or made over 2,500 collections, many of which contain hundreds of specimens collected, and reach Accession Number 4,850. It has consequently been necessary for one person to give most of his time to the proper preservation of specimens and the preparation of notes upon the same, but as it is an excellent basis of further work for this or any other kindred office, such as the State museum, it has been time and effort wisely expended.

By actual count our record accessions during the past year have been 3,250. Many of these contain collections of hundreds of the same kinds of individual specimens made on the same day and under the same conditions, and all given the same Collection and Accession number. Thus we do not hesitate to say that the total number of specimens collected and preserved either temporarily or permanently in this office, either by ourselves or contributors, has been not less than 100,000 individual specimens. These are used not only for

comparison and study, but also for illustrations for lantern slides and published photographs for our leading articles.

SCHOOL COLLECTIONS.

The subject of School Collections, Nature Study, and the Elements of Agriculture in the schools is becoming more important every year and can no longer be ignored by this State. We are saving our duplicate specimens and only need help enough to prepare these properly and classify and arrange them, showing which are injurious and which are beneficial, when we shall be able to send them to schools in this State for the use of teachers and pupils who may profit by them in their studies of Nature. A great many teachers have written to us about this and express high approval of the plan here outlined.

EXPENDITURES.

The expenditures of this office have been kept just as low as possible to perform the services that are needed. In doing this we have incurred the enmity of several persons who appear to have looked upon State expenditures as a regular method of "graft" and thought they could double their bills because the State was to pay them for it. Examples of such persons could be mentioned specifically, and it is remarkable that so many individuals look upon a State account as something that ought to be drawn upon much more freely than a private account. While the Economic Zoologist has not had the direct expenditure of any money, but accounts from this office must receive the endorsement of at least two persons before they are paid, thus fortunately, making it impossible for anyone connected with the office to enlarge accounts or engage in questionable transactions, we have made certain necessary expenditures but have in all cases kept them down to the same price as would have been paid had we been using our own money for the purpose. The accounts of this office are open for inspection at all times to persons who may be interested in them, which is invited. It is greatly to be regretted that an inevitable result of any man accepting a State office is the attempt of some person or paper to besmirch his character by the unjustified charge of "graft."

Last fall when our demonstrators could be engaged for only two months, in order to get competent men we were obliged to pay one hundred dollars per month and expenses. This spring it was found that in order to reach all the counties of this State with our inspectors and demonstrators it was necessary to cut down the salary to sixty dollars per month, and a few of our best men resigned because they could get better pay at other employment. However, the work has now been organized so that we are sure to receive maximum services for minimum cost, and when the citizens of this State know all the facts, they will understand that every cent that was intended to promote the work of this office has been placed where it will do the most good in their behalf.

EMPLOYEES.

A year ago the official help in this office consisted of but a clerk, besides the Economic Zoologist, and no other assistance of any kind.

The last Legislature provided for an Assistant Economic Zoologist, a messenger and a stenographer. Mr. N. G. Miller, a graduate of the Agricultural Course of 1904 of the Pennsylvania State College, was made Assistant Zoologist. Mr. L. R. White, a graduate of the Agricultural Course of the State College for 1905, was made scientific messenger, and Miss Kathryn P. First, of Harrisburg, Pa., was made stenographer, and Mr. Alfred F. Satterthwaite, of Chester county, was made clerk. On the Field Experimental Force we have Mr. T. C. LeFevre, graduate of the Biological Course of the Pennsylvania State College of 1904, R. F. Lee, of Bedford, Pa., and D. K. McMillan, of Gettysburg. All of these persons understand the elements of entomology and zoology and are deeply interested in their subjects and in promoting the work of this office. We are certain that the most perfect Civil Service examinations could not result in giving us a better corps of assistants than we have at present. With this staff both in the office and in the field, and our able demonstrators and inspectors, and the strong support that we have received from Governor Pennypacker, the Board of Commissioners of Public Grounds and Buildings, Superintendent Shumaker, and yourself, Mr. Secretary, it is no wonder that this office has made a remarkable growth and has accomplished a great deal in behalf of the citizens of this State in a field which had heretofore been wholly neglected.

There is so little legislation needed that it is not worth while mentioning it at this time, and we only await with most pleasant anticipation the needed room we shall have in the new quarters of the Capitol into which we hope to move soon, and at least a small insectary or building, like a greenhouse, to be devoted to the rearing and study of living insects.

Respectfully submitted,

H. A. SURFACE,

Economic Zoologist.

PROCEEDINGS

OF THE

STATE BOARD OF AGRICULTURE,

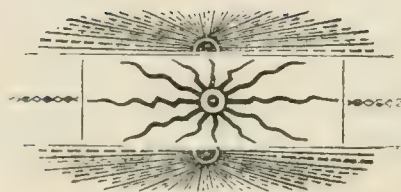
AND

FARMERS' NORMAL INSTITUTE,

HELD IN

Memorial Hall, West Chester, Pa.,

MAY 23-26, 1905.



PROCEEDINGS OF THE PENNSYLVANIA STATE BOARD OF
AGRICULTURE, AT A MEETING HELD IN MEMORIAL
HALL, WEST CHESTER, PA., TUESDAY, MAY 23, 1905.

ORDER OF BUSINESS.

Call to order at 2.00 P. M.

1. Roll-call of Members.
 2. Reading of Minutes.
 3. Appointment of Committee on Credentials.
 4. Reception of Credentials of Members-elect and Delegates.
 5. Report of Committee on Credentials.
 6. Unfinished Business.
 7. New Business.
 8. Miscellaneous Business.
 9. Adjournment.
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Memorial Hall, West Chester, Pa.,
Tuesday, 2 P. M., May 23, 1905.

Vice President, Geo. G. Hutchison, in the Chair:

THE CHAIRMAN: The Board will please come to order. I am sorry that the Governor is not here to fill this place; he may be later. We will take up the order of business as you find it printed in the program furnished you. On page seven is the program for the Board meeting. The first thing in order will be the roll-call of the members by the Secretary.

Secretary Critchfield proceeded with the roll-call and the following members of the Board were present:

A. I. Weidner, J. S. Burns, S. S. Blyholder, S. S. Diehl, H. G. McGowan, F. Jaekel, E. E. Chubbuck, W. T. Davis, W. H. H. Riddle, W. H. Howard, M. E. Conard, S. X. McClellan, J. W. Nelson, J. A. Herr, H. V. White, M. W. Oliver, Chas. Mullen, John M. Witman, S. D. West, C. B. Hege, R. M. Kendall, N. M. Biddle, Geo. G. Hutchi

son, S. M. McHenry, Matthew Rodgers, Henry W. Northup, W. H. Brosius, Sam'l McCreary, H. C. Snavely, P. S. Fenstermaker, J. H. Snyder, A. J. Kahler, S. B. Colcord, W. C. Black, M. M. Naginey, R. F. Schwarz, W. F. Beck, I. A. Eschbach, A. T. Holman, W. H. Stout, J. F. Boyer, Jacob S. Miller, J. K. Bird, E. E. Tower, J. Newton Glover, August Morek, R. J. Weld, D. S. Taylor, Warren E. Perham, M. N. Clark, D. A. Knuppenburg and G. F. Barnes.

Of the Consulting Specialists, the following were present:

Dr. J. H. Funk, pomologist; Dr. Leonard Pearson, veterinarian; Prof. Franklin Menges, entomologist; Prof. H. A. Surface, ornithologist; Col. H. C. Demming and W. H. Stout, geologists; and Prof. Geo. C. Butz, apiarist.

The CHAIRMAN: The next thing in order will be the reading of the minutes of the last meeting.

Secretary Critchfield then read the minutes of the last meeting.

The CHAIRMAN: You have heard the reading of the minutes. Are there any corrections?

A motion was made that the minutes be approved as read.

SECRETARY CRITCHFIELD: Mr. Chairman and Members of the Board of Agriculture: Before the approval of the minutes, perhaps it will be well for me to state that the Executive Committee had a meeting just before we went into session, and this meeting was called for the reason, that after some correspondence of the Secretary with Dr. Wadsworth, who was elected by the Executive Committee or appointed as one of the geologists of the Board, it was thought best to excuse Dr. Wadsworth and appoint in his place, Col. H. C. Demming, who has been the geologist of the Board for years past. Dr. Wadsworth had written to the Board and asked to be excused, and gave as his reasons that his work had been increased so much that it would be practically impossible for him to attend the meeting of the Board and to make a regular report. I am not able to say whether I mentioned that matter to the Executive Committee or not; it is quite possible that I did not. So I wrote to him to ascertain whether it was his desire to continue or still his desire to be relieved, and his answer confirmed what he had said in the former letter, that he was very busy at State College. If, however, the Board thought best, he was willing to do the best he could and so he left it with the Committee and the Board, and the Executive Committee has taken action and asked me to report as I have now done. I think it might be well for this amendment to the Executive Committee's report to be acted upon by the Board before the approval of the minutes.

Upon the request of the Chair, the previous motion was withdrawn and followed by a motion to approve the report of the Executive Committee as stated by the Secretary, which motion was agreed to; whereupon the motion to approve the minutes of the last meeting, as read by the Secretary, was renewed and agreed to.

The CHAIR: The next thing in order is the appointment of a committee on credentials. The Chair appoints as such committee: Joel A. Herr of Clinton county, J. W. Nelson of Clearfield county, S. M. McHenry of Indiana county, W. H. H. Riddle of Butler county, D. A. Knuppenburg of Wyoming county, W. H. Howard of Cameron county and G. F. Barnes of York county.

Any one having credentials from local societies or horticultural societies will please hand them to Mr. Herr, the Chairman of this Committee.

On motion of Mr. McClellan, duly seconded, it was agreed to pass over Section 5 on the program.

Mr. Temple made an announcement at this time in reference to the Normal School extending an invitation to the members to visit the school any afternoon this week after four o'clock, also an invitation to visit the Separator works.

The CHAIR: You have heard these announcements. Dr. Phillips stated to me this morning that he should be very much pleased to have any one here visit the Institution. They have an elegant Institution, with beautiful surroundings and they are doing good work.

The CHAIR: Unfinished Business is next in order.

None was presented.

The CHAIR: The next is New Business. The newest I know of is that I believe the Governor has signed the bill allowing \$3,500, is it not, to pay the expenses of the Board. The Board members have been paying their own expenses at annual meetings.

The SECRETARY: It was approved on the 11th day of May 1905. The amount is \$3,500. Mr. Chairman, in regard to that matter I want to say that I had a talk with the Chairman of the House Committee on Appropriations before drafting the bill, and he said to me: "I hope you will make the amount just as low as possible in order to meet the expenses which you wish to meet," and I made as careful a calculation as I could and I thought that \$3,500 would be sufficient. If we find that it is not enough, we will have a chance hereafter to ask that it be increased. The important thing was to get the thing started. A like bill had been turned down on

several occasions, and the Appropriation Committee do not like, as a general thing, to take up a thing that has been turned down, and the Governor, as a general thing, don't like to sign a bill that has been disapproved by his predecessor.

MR. BLYHOLDER: Mr. Chairman, I move you that this Board extend their thanks to the members of the Legislature, and the Governor for giving us this legislation.

MR. STOUT: I move to amend, by adding all others who aided in getting the appropriation passed.

The amendment was accepted and the motion, as amended, agreed to.

The CHAIR: It is so ordered and the Secretary will communicate this to those interested.

Dr. Armsby of State College was called for by the Chairman.

DR. ARMSBY: Mr. Chairman, I did not expect to be called upon to say anything at this time, but I can say very briefly that the Legislature, while it did not entirely meet the wishes of the friends of agriculture, did make, on the whole, a very liberal appropriation for the promotion of agriculture at the State College. It approved the request for \$150,000 for the construction and equipment of the agricultural building for which \$100,000 was appropriated in 1903. In the same connection the bill carried an appropriation of \$24,000 for the extension of the steam and electric plants and for piping, the construction of a tunnel and for providing light and heat and power for the same.

In addition to this, there was an appropriation of \$30,000 for two years for the maintenance of agricultural courses and \$10,000 for two years for the maintenance of an agricultural experiment station, besides a small item of \$2,500 for the erection of an implement shed and poultry plant on the experiment station farm. The bill in this form went to the Governor, and as a good many of you know, he approved the items for maintenance, but found it necessary, on account of the limitation of the State's revenue, to disapprove part of the items, reducing it from \$150,000 to \$75,000 and disapproving entirely the item for the tunnel and other matters providing for the heating and lighting plant, so that the total of the appropriations approved by the Governor is about \$114,000. I am trusting somewhat in making these statements on the report of the Legislative Committee of the allied agricultural organizations which are about to meet, immediately following this. Having been called upon to make this statement, it seemed best that I should, to this extent at least, anticipate their report.

What action it will be found best to take, I am not in a position to say; the matter so far has not been determined. The College will not relax in any way its efforts for the advancement of agriculture, and it will not rest satisfied until they see that agricultural building completed according to the plans which were virtually authorized two years ago.

We shall simply go ahead with the work in the completion of the agricultural building, and with the funds we have shall probably be able to complete about half of it, and we shall simply use that half as best we can, making no reduction in the size or quality of the building, simply going as far as we can and stopping, depending upon the legislature, through the influence of the farmers in the State, to provide the means for completing it and fully equipping it two years from now. In the meantime we have a somewhat increased maintenance fund which we hope to be able to use for the advantage and benefit of the agricultural interests of the State. It is too early yet to say just what we shall do with it, but it will certainly have a very careful consideration by the Board of Trustees and those most interested in carrying out the policies of the College, and we shall try to serve you to the best of our ability with the funds thus placed in our hands.

DEPUTY SECRETARY MARTIN: Mr. Chairman, and Members of the Board: We are pleased to announce that through the generosity of Mr. Kates, the owner of a farm over which our good friend Mr. Detrich is placed in charge, we are invited to visit their farm to-morrow at twelve o'clock. Conveyances will meet us here at the Hall by arrangement to carry all the delegates and members out to this farm, where a lunch will be prepared for us, and in the barn, if the weather should be unfavorable outside, we will hold the afternoon session of our normal meeting.

This is a very generous offer and affords a fine opportunity for the members and delegates not only to visit this farm, but to view the beauties of old Chester county in that portion of it.

I feel quite certain that every visitor will be pleased to have this opportunity to see something of the remodelling and revising of what we are sometimes pleased to call a farm that has hitherto been neglected, and to see something of the contrast as between this neglected place and the methods of modern cultivation and improvement. It is our opportunity. As we go to this farm, let it be with the object in view to learn something for ourselves, and to gather suggestions from the very worthy ownership and management of this farm. I cast my eye about but fail to see Mr. Kates in the audience, but I see Mr. Detrich here.

I hope that every member will get acquainted with Mr. Kates, and

I had hoped that he would be present and favor us with some remarks at this time. We would like, however, to hear from Mr. Detrich as his representative.

MR. DETRICH: Mr. Chairman and Members of the State Board of Agriculture: I will say on behalf of Mr. Kates, that he is very glad to have the opportunity of inviting you to visit his farm. He took the farm under most adverse circumstances and the conditions were such as to present great difficulties that we are beginning to overcome. We are very much pleased with the progress already made and would like to have you come and see for yourselves what is being done in accordance with the methods carried on for many years at Flourtown. We shall be able to show you some fields that have never been touched and some on which we are applying the methods that were so successfully used at Flourtown. You can see the contrast for yourselves between the fields that have been redeemed and taken care of, and the fields lying just as they were one year ago. We are very anxious for every person in this audience to see the proprietor as well as myself, and we want to meet you all at "Harvest Home Farm" to-morrow afternoon.

The Committee on Credentials announced through its Chairman that it was ready to report.

REPORT OF THE COMMITTEE ON CREDENTIALS.

The Committee on Credentials Respectfully Report that we Examined the Credentials of the Following Persons for Membership in the State Board and Found them Correct:

W. C. Black, Mercer county, term expires, 1908.

R. F. Schwarz, Analomink, Monroe county, term expires 1908.

J. Newton Glover, Vicksburg, Union county, term expires 1908.

(Signed.)

J. A. HERR,

D. A. KNUPPENBURG,

W. H. H. RIDDLE,

G. F. BARNES,

W. H. HOWARD,

J. W. NELSON,

S. M. McHENRY.

Committee.

On motion, the report of the Committee on Credentials was adopted as read.

MR. HERR: Mr. Chairman, I am advised that I. A. Eschbach, of

Northumberland county has credentials but has only recently received them, and they not being before the Committee, we could not act on them. I would move that Mr. Eschbach be allowed a seat with us, and to act with us during this meeting.

Motion seconded by Secretary Critchfield.

The CHAIR: Would it not be well to amend that to this extent, providing his credentials are in due form.

The motion of Mr. Herr was agreed to.

SECRETARY CRITCHFIELD: Mr. Chairman and Members of the Board: It will be remembered that the Secretary was requested at our last meeting to appoint committees on fruit and vegetables. This of course is an unseasonable time for the exhibition of fruit, yet we do not know but what some member of the Board may have brought some fruit here that was kept in cold storage, and I do not know of anything more pleasant to look upon. I wish to announce that I have appointed, with the consent of the parties, Messrs. J. H. Funk of Berks county, J. H. Ledy of Franklin county, two of the leading fruit growers of our State, and the Chairman, Mr. Hutchison, and Mr. Stout of Schuylkill county, and Mr. Miller of Somerset county, to act as a committee on vegetables.

I want to say further, that Mr. Temple assures me that ample arrangements have been made for receiving and displaying any fruit or vegetables that may be brought in during our session so that if any of you have samples to bring, you can bring them in.

The CHAIR: I see in the audience some Chester county people, among them my good friend, Mr. Downing, who has been associated with us for many years. I hope he will have a word to say to us.

MR. DOWNING: Mr. Chairman, I am very much gratified to meet the members of the State Board again and especially so in my home—near to my home. There are some yet remaining in the Board that I remember with a good deal of affection, although the members are now mostly strangers to me. At the same time I will say that it is with great pleasure that I welcome you all to Chester county. Chester county people are like other people. I find when I travel that the people all over the country are good people on the average. It is so all over the country. I find among the young people in street cars both courtesy and kindness. If you go into a bank or into the homes of the people in the United States and get a little in touch with them, they will be interested in you at once. We are just like all our people, good-hearted and all that.

I hope really you will enjoy yourselves while you are here and I hope that I may have the pleasure of meeting you all again.

The CHAIR: I see here our friend, Mr. John I. Carter, a Chester county farmer. I will be glad to hear from him.

MR. CARTER: Mr. Chairman, and Members of the State Board of Agriculture: I won't undertake to make a speech at all. Like our friend, Mr. Downing, I am very glad to meet you here and to see some members of the old Board again. Some of the most pleasant times that I can recall are when the State Board of Agriculture met, with Governor Robert E. Pattison as Chairman of the Board. Those days were pleasant days and I think profitable, and have left good seed in the land that is going to bring forth fruit. I am glad to meet you all.

The CHAIR: I see my friend, Mr. Fox, from over in Chester Valley present. I know that we would all like to hear from him.

MR. FOX: Mr. Chairman, it is a well known fact that I am not a public speaker, but I assure you that we plain farmers of Chester county are pleased that you have come to the city of West Chester to hold your annual meeting. When it was announced to us some time ago that you would meet with us, we thought then, or we understood it would be in the Fall, and we had been making an effort to bring together the farmers to try to show you what we can produce in the way of agricultural products. That led to an organization which we trust will not only be a pleasure but a practical benefit to the farmers of this community. We have organized an agricultural society brought about by your decision to come here and meet with us.

One of your members thought that you would meet here in October or some time in the Fall. We then, as I have said before, began to work together for the purpose of organizing a county fair, and that led to the organization of a permanent association. We hope that many of you will be with us in the Fall to witness our own exhibit in that line.

I am glad to learn that one of our farmers invited this body to visit the farm across the valley and see how they manage things out there. You will see many farms that are productive in this valley, not exactly along the line of our neighborhood in this valley, but carefully, economically and scientifically carried on.

This is a dairy county, one of the best dairy counties I think in Eastern Pennsylvania, in fact, I do not know its equal anywhere. It is well adapted to that industry. We are not depending on clover entirely for that purpose, to produce grass. Our highlands along the Brandywine Creek grow excellent grass; it is surprising that they produce as much as they do and it is due to the natural fertility of the soil.

We trust that your meeting here will do us much good and that we will derive great benefit from your coming. I was not aware that this was to be a meeting of this character this afternoon, but I think that your meetings later will develop papers that will be very useful and instructive to us.

The CHAIR: We have a gentleman here from way out near the Ohio line that we are always delighted to have with us—Brother Orr. We would like to hear from him now.

MR. ORR: Mr. Chairman and Members of the State Board of Agriculture, and Ladies and Gentlemen: Our friend on the left here, said to me, "Now you can get up and crow." That reminds me of a little experience over in New Jersey some two or three years ago, where an Ohio man was called upon and he was a dairyman, and I a chicken man. There was a bee man there also, and he and I had an argument on which was the more useful animal, the cow or the hen, and since then, whenever they get a shot at me, they are always throwing it at me, "Now, old rooster, it is your time to get up and crow," or, "Old hen, it is your time to rise up and cackle." My time to crow and cackle is later on, upon this program. I am very much surprised that the Chairman should call on me now to say anything this afternoon. I came utterly unprepared and without thought.

My first experience in Pennsylvania was nineteen years ago this summer, when I first came into the State and the very first place I went to was to Chester county and I stopped at one of the hotels at West Chester, and from this place, as a central point, I traveled out over this great county of Chester studying its agricultural and livestock interests and particularly its dairy interests. The things I saw and learned then in Chester county impressed me so much and so favorably that I have always regarded Chester county as the county which stood ahead of all others in Pennsylvania as an agricultural, live stock and dairy county.

It was my pleasure to have as guides, two well informed gentlemen who showed me what I saw in Chester county. They took a great deal of pride and pleasure in pointing out to me the points of historical interests of which this county is so full. Notwithstanding the years that have passed, that first impression still remains with me, and I have always regarded Chester county as a good school to which a young man might come.

As I have crossed Chester county since and seen the changes taking place in dairying lines particularly, I have been much impressed. We do change; the world does improve, for nineteen years ago the dairy methods were entirely different from what they are now. Now you have in this city one of the largest, if not the largest,

manufacturing institutions in the world, sending out separators wherever dairying is carried on. There has been a wonderful advance along all those lines, and it is with a great deal of pleasure that I am permitted to be here to-day, and I look forward with a great deal of interest to the privileges which we shall enjoy at this meeting.

MR. MARTIN: This Board is always glad to renew the acquaintance of Brother Orr and I know they will be doubly glad when they learn that his worthy wife is present with us. Mrs. Orr has come along this time to kind of take care of him, and we would highly appreciate a word from Mrs. Orr.

The CHAIR: We shall be glad to hear from the lady, Mrs. Orr, of Beaver.

MRS. ORR: Mr. Chairman, Ladies and Gentlemen, This is certainly a great surprise to me, but it is also a great pleasure to feel that I have been so honored as to be called upon to say even one word to this agricultural board, and I thank you. I feel very much like a child again and can hardly realize it at all. I am here to learn from you, but if I can at this time or any other time say or do anything that will in any way promote any true line of the work in which you are engaged, I am at your service.

I was so delighted to see these—our fathers shall I say—sitting near me here, rise and speak to us and tell us their experiences. How delightful are the recollections they have in these days when they feel that in a certain way they are laying down active service; and yet when they rise and speak to us so beautifully and so well such words as they have to-day, are they not now doing their greatest service? And I want to say just here, to speak what I truly believe, that we so often in life in the hurry and the bustle and the noise that we make, lose sight of the fact that perhaps, after all, when our more active life ceases, we may be speaking and doing and exhibiting our very greatest work when we step out of active service. I have been brought to think of that line particularly recently by the death of a man in our own community whom we all respected very highly, and yet whose services so frequently were not appreciated. Suddenly he was taken away from us and now we feel that his work is but begun, so our fathers who sit with us perhaps are now doing us their greatest service, while the work that we think we are doing here so well, is perhaps but begun.

The CHAIR: Is there any other one here who wishes to say a word? If so, we shall be glad to hear from you. You all can talk on some subject; let us spend a little while in that way, if it is your pleasure.

MR. BLYHOLDER: Call on some more.

The CHAIR: Well, I will call on Brother Blyholder, then.

MR. BLYHOLDER: It does not seem to me that we gentlemen should go away this afternoon without spending some time, if not in the actual work, as we might say, of the Board, discussing results and things of that kind, yet in a social way, it seems to me, we can do a great deal that may be beneficial.

I want to say to you frankly that this is my first visit to West Chester, and I called on a gentleman to-day whom I have met before in agricultural meetings, not of this body, but in other meetings for a number of years. He is now ninety years of age and he is not able to go out of his house, whose hands I shook this afternoon and whose grasp I will not soon forget. I would feel fully repaid for coming here by that warm hand-grasp if there were nothing else and it seems to me that we may well pay more attention, and profitably devote more time to the social features of farm life, for when this has been lost, a great deal has been lost.

I am glad that it is my good fortune to be present with you here to-day and to look in the face of Brother Downing, and other friends whom we have the pleasure of meeting here, who are engaged in the same work with us along agricultural lines. I came into the Board some years ago when I was considerably younger than I am to-day and Brother Downing was then an active member, as well as others I might mention. My relations with the Board have always been very pleasant and they have done a great deal for me along agricultural lines as well as a great deal for me in social lines.

I feel that we are engaged in a great work in agriculture, and I believe that this is going to be a great meeting here. I am sure that Brother Martin has prepared for us a strong program from which we shall all derive a great deal of valuable instruction, which will be of great benefit to us in carrying on the work along all the lines in which we are interested and in these Farmers' Institutes that are doing so much and have done so much in the promotion of the interests of the farmers of this great Commonwealth. It is a pleasure to me to come to Chester county, and there is only one thing that I have seen that I do not like to see and that is, the many weeds that I have noticed in passing over some portion of the county, so many weeds growing along in some places that I could hardly realize I was in Chester county. If we can find some method that will lead to the destruction of these weeds while we are down here attending this meeting, it will certainly be a grand good thing for Chester county.

Now I think I have occupied more time than I should and I will give way to my friend Robert Seeds and he will come forward and tell us all he knows about farming.

The CHAIR: We shall be glad to hear from Mr. Seeds, and he will please come forward.

MR. SEEDS: Mr. Chairman, I do not think it is altogether fair to bring a man out here into this meeting just on the spur of the moment, just the moment he comes into the hall. I don't know anything about the program, or anything that has been done here this afternoon. I am pleased to meet with you; I am always pleased to meet with the farmers, and with all the people interested in agriculture. Since I live on a farm and since I am interested in agriculture, I want to meet with the people who are interested along the same lines, because as "iron sharpeneth iron," so we will be benefited by meeting with the people interested in the same calling. If I was to move off my farm to-morrow and go to the State of Illinois, and engage in some other line of work, I would turn my back on the people engaged in agriculture and go and meet with the men engaged in my line of work. If we sat on a locomotive, I would meet with the men who run locomotives. But I am here to-day because I am interested and you are all interested in the promotion of the interests of agriculture, because I believe I shall be benefited by the association, and that my calling will be benefited.

I believe in looking ahead and never looking behind. If I have got to pay a note that I have endorsed for a man, after I pay it I never think about it. I am always looking into the future and always keeping my eyes towards the sun, because then I know that the shadow will fall behind me. Ever since the time when the world was brought into existence men have been thinking about new things, and reaching out after new and improved methods. They have been saying that this won't do, and that won't do at all; we must have something better, and so the world continues to move on. It has been so from the time that Adam went into the Garden of Eden up to the present time, and the mighty steamship that now crosses the ocean has been a development from the little boat originally constructed by Robert Fulton. When Fulton was building that steamboat, he had a rich uncle who had money to burn, and the uncle told him it wouldn't do, but Robert Fulton worked on; he never ceased his efforts and after his little steamboat was completed and he pushed it out into the Hudson River, and rang the bell to go ahead, there was trouble in in that steamboat and it wouldn't move, and his uncle stood on the bank and said, "I told you it wouldn't go; it will never go." But Robert was not discouraged. He took his wrenches and his tools, and he did this and he did that, he adjusted this bolt and that screw, he did a few things that he thought necessary, and then he pulled the throttle open, and his little steamboat moved on, and his old uncle stood on the bank and shouted after him and said, "You'll never get it stopped, you'll never get it stopped!" This is the way things have

been going ever since the foundation of the world. I am spending money to-day and paying expressage, trying this thing and that in the endeavor to improve and to progress, and gentlemen, as long as I am interested in agriculture, I am going to meet with you people, because I believe that it is our duty to continue to move on, to forge ahead, and if a man lives to be as old as Methusaleh, he shall still keep at it, and not be satisfied with the progress made by his ancestors, but keep right on moving and forging ahead. Nothing is so successful as success, and the great thing is to hit the mark and to hit it hard, and you have got to strike while the iron is hot.

Speaking of hitting the mark brings to my mind the story of an old lady going to an experience meeting, and she got up to give her experience and to tell what she was thankful for. Now this seems to be something like a Methodist experience meeting with Brother Hutchison presiding. This old lady got up and said that she was thankful for one thing, and that was that she had one tooth left above and one tooth left below and they hit and I tell you I have learned something which will follow me all the days of my life, and that is, that unless you hit the mark, there is no success. I wouldn't read a poem if I had to go over two or three pages in order to get one point. I can't afford to spend that much time simply to get one point. He has got to hit the mark as soon as he takes up his pen, and that is the reason I like to read after James Whitcomb Riley, the Robert Burns of America; he hits the mark.

I thank you for the privilege of saying these few words, Brother Hutchison. I know we will all go home and be benefited through what we learn here for the work that is to be done in the future. I want to say to you as Institute workers, we men on the platform—that the men down in the audience are getting up pretty close to us; don't forget that. I notice that every day in my life. I noticed it right over here north of Philadelphia when the farmers got after Prof. McDowell and plied him with questions as to the difference between rock and bone, and some man asked me a question before I got started, and I stood there for three-quarters of an hour and never said a word of my speech, trying to answer the questions. This shows that the men in the audience are thinking about things and are hitting us close and hard.

I thank you, gentlemen, for this privilege and I am glad to meet you all and after awhile I will give you all the privilege of meeting me at the door and shaking me by the hand.

The CHAIR: I see Dr. Rothrock present, and I know we would all be glad to hear from him. Will the doctor please come forward?

DR. ROTHROCK: Mr. Chairman, I did not expect to say anything this afternoon. I thought you would hear me to-night, and I would

wear out my welcome then. I am glad to see so many of you here as there are. I had hoped that we might have this hall full to-day and am sorry that I cannot be with you more, but I have a number of extensive operations going on in another part of the State and had simply come home for the purpose of packing up to get off, and thought I would take the time to call and see you here. We are glad to see you in Chester county. We believe we have got here in Chester county one of God's own spots. I have traveled over a good deal of North America and am always glad to get back to Chester county, not simply because it is my home, but because I find that wherever I go there is no place that appeals to me so much as this county does. We have got a magnificent section of the State here. We haven't got the great coal mines of the central part of the State. There are a great many things that other regions have that we do not have, but we have a splendid section, and we have an honest, intelligent community here who will welcome you I am sure with open hands and open hearts. Whatever makes for the interest of agriculture, we believe makes for the interest of this great country. It is true that my work has not been very largely in agriculture, as agriculture is understood usually, yet I believe that the work which I have in hand and in my humble way have been trying to do, is one that will help agriculture in the end.

Take for example the work we have been doing in the Cumberland Valley. A short time ago a certain official said to me: "You have paid too much money for the land you have purchased in the Cumberland Valley, \$3.50 an acre. You could have gone into my county and have bought three times that amount of land for the same money;" all of which was true, but what good would that land there have done for the Cumberland Valley? We purchased 50,000 acres of land there and we purchased it for the State as long as time endures, and so long will the benefits inure to that county as the result of that purchase, and I believe the prosperity of the whole Cumberland Valley depends upon the forestry conditions which will be promoted by this purchase. Governor Stone made a remark some time ago that was eminently wise. It was this: "If the forest reservation is a good thing in Cumberland county, why is not a forest reservation a good thing for every part of the State?" Now Governor Stone was right. I hope to see the time come when every county of this Commonwealth will have the water nurtured, for water is a necessity for the sustenance of your crops and your flocks, and I hope that every county in the State of Pennsylvania will have a forest reservation.

In 1880 I visited Germany and when I was there, for the first time in my life I saw what the people were doing on waste land. Now what does it mean to Germany? The forest reservations of

Germany? Why it means that the revenue that the German Empire receives from its state forest reservations is so great that if you were to blot out that revenue from the German treasury, you would reduce the German Empire to a second-rate power on the map of Europe. We are only beginning to see the importance of this, when our great corporations are stealing upon the water-courses of the State for the purpose of turning their wheels or driving their machinery. The headwaters of the State are essential to the health and prosperity of the Commonwealth. It is a very important thing that we should control the headwaters of all these streams so that our towns may have pure water; that the water which comes from your springs may be pure. A very large portion of those who die every year in our community die simply because of the filth and disease germs that are carried into their systems from the water. It is, therefore, important, very important, that the State should own these headwaters of the streams. Now these are just a few facts that I have had brought before me in the course of my duties as a public officer.

I want here to mention a little circumstance which may impress you as in the nature of a useful lesson. A number of the farmers believed in this great movement and were interested in it in 1893, and I had the honor for the first time then of appearing before the farmers of the State, and I read a paper there, and was fortunate enough to secure the approval of the State Board, or the State Board of Agriculture, as it then was. The gentleman who presided at that meeting, was one who had bitterly opposed the movement—I might almost say ignorantly opposed it, and when the unanimous vote was given, which asked the Governor of the Commonwealth to do what lay in his power to forward this movement, that gentleman saw then and there that he was opposing the sentiment of his agricultural brethren, and he could not get around quick enough the next day when he appeared in the House of Representatives. When he came into the House, he appeared on the other side of the question. That was all due to the influence of the farmers of this State.

MR. STOUT: Is it in order to offer a resolution at this time?

The CHAIR: Let us hear it.

MR. STOUT: Whereas, The Legislative Committee of this Board did not succeed in their efforts to obtain the consent of the Legislature granting the privileges to trolley railroads to carry freight, therefore, be it

Resolved, That, in the opinion of the members of this Board, the demand for the enactment of the proposed law should be again presented to the next session of the Legislature by the Legislative Committee.

The adoption of the resolution having been moved and seconded, it was agreed to.

DEPUTY SECRETARY MARTIN: I want to state that this evening's session will be presided over by Dr. M. E. Conard and there will be an address of welcome by Burgess Charles H. Pennypacker, and if the Governor is present, he will respond to that address. There will also be an address by Dr. J. T. Rothrock and by Dr. J. H. Funk.

MR. HERR: Mr. Chairman, the talking this afternoon has been along lines which interested me very much. In looking around it makes me feel older than I ever felt before to find so few members of the Board of Agriculture who have been working with me for many years on this Board; but it affords me a great deal of pleasure when I turn around and meet my Brother Downing here. He was an effective and efficient working member of the Board, contributing so much to the literature of the Board and whose history will be found recorded in its minutes and in its annual reports. I have also had the pleasure of meeting quite a number of others who have been with us quite a long time on the Board. I was glad to hear from Dr. Rothrock and the citizens of Chester county; and I want to say that the State will never be able to repay the services of some of the citizens of this county, and especially of the services of Dr. Rothrock and Brother Downing and Brother Carter. These are three men whom the State will never be able to pay for the actual services they have rendered in the work of your Board and in the work of the Department of Agriculture.

I am very glad indeed that we have to-day the pleasure of meeting in their county, and I am pleased that the Governor has seen fit to recognize the Board in approving the act of the Legislature providing money to pay its expenses. I hope the Board will be filled up, and those who are here will not only be as efficient, but will be as earnest and as sincere as the members of the Board have been for the last twenty-five years.

On motion, the Board adjourned.

N. B. CRITCHFIELD,

Secretary.

DIVISION OF FARMERS' INSTITUTES.

LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1905-6.

County.	Name and Address of Chairman.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler
Cambria,	H. J. Krumenacker, Carrolltown, R. F. D.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Millhall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Elk,	John B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Fayette,	Sylvester Duff, Smock.
Forest,	C. A. Randall, Tionesta.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warriors' Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	W. L. McCracken, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton, R. F. D.
Lancaster,	W. H. Brosius, Drumore. E. S. Hoover, Lancaster, R. F. D.
Lawrence,	Samuel McCreary, Volant, R. F. D.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.

County.	Name and Address of Chairman.
Luzerne,	J. E. Hildebrandt, Dallas R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	L. W. Howden, Coryville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Monroe,	Randall Bisbing, East Stroudsburg.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	Edwin Lonsdale, Girard College, Phila. J. B. Kirkbride, Bustleton.
Pike,	B. F. Killam.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro
Union,	T. Newton Glover, Vicksburg.
Venango,	V. A. Crawford, Cooperstown.
Warren,	George A. Woodside, Sugargrove.
Washington,	D. S. Taylor, Raccoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	O. A. Knuppenburg, Lake Carey
York,	G. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1905-6.

- Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
Barclay, Richard D., Haverford, Montgomery county.
Bashore, Dr. Harvey B., West Fairview, Cumberland county.
Beardslee, R. L., Warrenham, Bradford county.
Black, W. C., Mercer, Mercer county.
Bond, M. S., Danville, Montour county.
Brodhead, C. W., Montrose, Susquehanna county.
Bruckhart, J. W., Lititz, Lancaster county.
Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
Butz, Prof. George C., State College, Centre county.
Campbell, J. T., Hartstown, Crawford county.
Clark, M. N., Claridge, Westmoreland county.
Conard, Dr. M. E., Westgrove, Chester county.
Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
Cox, John W., New Wilmington, Lawrence county.
Cure, Z. T., Jermyn, Lackawanna county.
Detrich, J. D., West Chester, Chester county, R. F. D. No. 12.
Drake, W. M. C., Volant, Lawrence county.
Duvel, Prof. J. W. T., Washington, D. C.
Ellis, David M., Bridgeport, Montgomery county.
Funk, Dr. J. H., Boyertown, Berks county.
Hall, Horace H., Ellisburg, Potter county.
Hantz, Prof. J. M., Merrittstown, Fayette county.
Harshberger, J. W., Ph. D., Philadelphia.
Herr, Joel A., Millhall, R. F. D., Clinton county.
Hill, W. F., Chambersburg, Franklin county.
Hoover, Hon. E. S., Lancaster, Lancaster county.
Hull, Geo. E., Transfer, R. F. D., Mercer county.
Kahler, Hon. A. J., Hughesville, Lycoming county.
Kester, R. P., Grampian, Clearfield county.
Ledy, J. H., Marion, Franklin county.
Lehman, Amos B., Fayetteville, Franklin county.
Lesh, N. M., Sciota, Monroe county.
Lighty, L. W., East Berlin, Adams county.
McDowell, Prof. M. S., State College, Centre county.
Menges, Prof. Franklin, York, York county.
Northup, Henry W., Dalton, R. F. D., Lackawanna county.
Orr, T. E., Beaver, Beaver county.
Orr, Mrs. T. E., Beaver, Beaver county.
Owens, Prof. Wm. G., Lewisburg, Union county.
Patton, James Y., New Castle, Lawrence county.
Peachey, J. H., Belleville, Mifflin county.
Philips, Hon. Thomas J., Atglen, Chester county.
Schock, O. D., Hamburg, Berks county.
Seeds, R. S., Birmingham, Huntingdon county.

Stout, W. H., Pinegrove, Schuylkill county.

Stuart, R. R., Callensburg, Clarion county.

Thayer, Dr. I. A., New Castle, Lawrence county.

Tower, Dr. E. E., Hop Bottom, Susquehanna county.

Wagner, F. J., Harrison City, Westmoreland county.

Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.

Watts, Prof. R. L., Scalp Level, Cambria county.

Watts, D. H., Kerrmoor, Clearfield county.

Waychoff, G. B., Jefferson, Greene county.

PROCEEDINGS OF THE FARMERS' ANNUAL NORMAL INSTITUTE HELD IN MEMORIAL HALL, WEST CHESTER, PA., MAY 23-26, 1905.

Memorial Hall, West Chester, Pa.,
Tuesday Evening, 7.30 o'clock, May 23, 1905.

Dr. M. E. Conard in the Chair.

The CHAIR: The address of welcome will be given by Charles H. Pennypacker, Burgess of West Chester, Pa.

Mr. Pennypacker's address is as follows:

ADDRESS OF WELCOME.

BY CHARLES H. PENNYPACKER, *Burgess, West Chester, Pa.*

Mr. Chairman, Ladies and Gentlemen: On behalf of this municipality of 10,000 people, I extend to you gentlemen, and ladies also, a cordial welcome to our town.

When William Penn stepped for the first time on the shore of Pennsylvania, he turned to his clerk, Caleb Pusey, and said to him, "This is a goodly land, what shall we call it?" And Caleb promptly replied, "Chester, after the place in England from whence we came." That name was conferred upon the mother county of this great Commonwealth, and I think that that county thus named, has for two centuries exercised considerable influence in the management and direction of affairs in the Keystone State.

It was a President of the United States who said that agriculture was the grand work of the nation, and all the world smiled at General Grant's quaint remark. It was, I think, then, it had been true for centuries and it is true to-day.

Now, my friends, the hopes, the hearts, the good wishes of the people of this Commonwealth are centered in the farmers' homes of Pennsylvania. Upon the escutcheon of this Commonwealth is indelibly stamped the plow, the oldest, the most useful, the most honored implement in all the history of agriculture; and in this old county of Chester of 720 square miles, containing about ninety thousand people, the agricultural interests are predominant, and to the

farmers of Chester county we look for all that is progressive, for all that is earnest, for all that is sincere, for all that is real in the advancing movements of this advancing age.

True it is we have had a pest called the scale, and that scale is to be found upon many of the alleged statesmen in this Commonwealth. Now that scale needs to be sprayed; these statesmen need to be treated to a shower bath of public opinion, and that spraying and that bath and that evidence of public opinion, is to come from the farmers of Pennsylvania, and you will find plenty of them in the county of Chester, my friends, who own themselves, who listen to no dictation from any alleged superior power. When I look over this great Commonwealth and observe its present condition, I am free to say to you that in Pennsylvania there is no Republican party; it is in the hands of a sequestrator, and has only reached the first stage of having an inventory taken of its assets. There is no Democratic party, for it is in the hands of a receiver and they don't know it. There is only one party in Pennsylvania, and that is the party of the people, and a "government by the people and for the people shall not perish from this earth," so long as the husbandmen retain their independence in action, in character and in achievement. The world cares nothing for what people say; it is what they do. They point to the fact, to the achievement, to the result, not to the spoken word; not to the wind-work that goes on all over this State. Where you find a man saying what he is going to do, you rarely find that he has done it, so that at last good government stands upon the basis of independent individual action, and I care not what may be said from this platform, we want results, we want achievement, we want some forward, progressive movement that will count for something upon the pages of contemporaneous history.

Now, my friends, I only desire to say this in conclusion. Do not be a lot of Jeremiahs; do not be a lot of lineal descendants of the prophet of lamentations. The times were never better than they are to-day because the people were never better. There never was greater prosperity in this Commonwealth than there is at this time. It is always better to look upon the bright side, the hopeful side, the cheery side of things. We are not a mass of rotten grafters in Pennsylvania, but we are a mass of people desirous of bettering our condition. Genius means energy and industry. Knowledge is not a synonym of laziness and inattention to sanitary details. What we want is to get results. Be cheerful. You are better housed, better fed, better clothed, live longer, have more money and more comforts than your fathers. We want to move along the car of human progress. That poet—that Robert Burns of America whose lines have reached every heart—has said, I quote from James Whitcomb Riley:

"Then one and all, let us be contented with our lot,
This beautiful May morning, the sun's been shining hot.
Let us all fill our hearts with the glory of the day,
And banish every care and doubt and sorrow far away.
Whate'er our occupation, with Providence for guide,
In such fine circumstances let us be satisfied.
The world is full of roses, the roses full of dew,
The dew is full of heavenly love that drips for me and you."

The CHAIR: It was the Governor's desire to have been here this evening, in which case he would have responded to the address of welcome. Unfortunately he has not found it convenient to be here, but we are fortunate in having with us one of his cabinet, the Secretary of Agriculture, Hon. N. B. Critchfield, and in the absence of the Governor, I will call upon him to make the response.

RESPONSE TO ADDRESS OF WELCOME.

BY HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

Mr. Chairman, Ladies and Gentlemen: The good Book says, "Let every one be subject to the powers that be," and the powers that be, it seems have decided that I shall take the platform.

And now, Mr. Burgess Pennypacker, and citizens of West Chester, and Chester county, I cannot say that it is with pleasure that I rise to respond to the very excellent and forcible address of welcome to which I have just had the pleasure of listening, because it is somewhat embarrassing to any one to be called on in this summary way. I am glad, however, to be here, and I am glad to have heard a part of the address of welcome. I was unfortunate enough to be called away about the time the address was begun to answer a call at the telephone, so that I only heard a part, and that was the latter part of the address, hence it is going to be very hard to respond to it intelligently under the circumstances.

We are very glad to accept the assurance of a welcome to this town and to this county. You know that people always estimate the welcome that they receive according to the estimate they put upon the people from whom that welcome comes, and if we are to appreciate our welcome in the same way, our appreciation of it must be very high indeed, for coming to you, Mr. Burgess, as we do from all over this great Commonwealth, we feel much like members of the same family, coming to visit a parent; or if not a parent, at least an older brother or older sister, for we are not forgetful that Chester county was the first county organized in the Commonwealth

of Pennsylvania. We are not forgetful of the fact that the first settlement made in Pennsylvania was made in Chester county and it was only a few miles south of this place where William Penn landed when he came from England and began his work in this great Commonwealth; so we are here from the sixty-seven counties of the State to visit this first county, or the older sister, or the one that we recognize as the mother of us all. And you know the wise King of Israel said that the "hoary head when found in the way of righteousness was a crown of glory," so we come here recognizing that this crown of glory is resting upon you, for you are the older sister or older brother of the family.

Reference was made in the address of welcome to which we listened, to the fact that this is a great agricultural county, and for this reason we take pleasure and satisfaction in receiving the welcome you have given. We feel that you are engaged in the same pursuits in which we are interested. We are here as a body of farmers, and you know, friends, the old saying that "birds of a feather flock together," and so we shall feel especially at home among you. We know that this is a great agricultural county, perhaps the greatest in the Commonwealth. We are all aware of the fact that at the last census, Lancaster county was reckoned to be the greatest agricultural county in the United States—in the whole country, but I doubt not if the estimate were made according to number of square miles in Chester county and Lancaster county, the result of that estimate would be in favor of Chester county. You have here the opportunity for, perhaps, the most diversified agriculture that can be followed in any part of the State. You certainly have every variety of soil, from the rich, micaceous soil found in the southern borders of your county, to the heavy and the rich limestone soil of the great Chester Valley which is just north of us, so that here we have an opportunity for almost every kind of agriculture. Why, I can remember when I was a boy of hearing of the immense fields of corn that were raised in Chester county. I can remember the time when we, in the western part of the State sold our cattle to dealers who brought them here to be fed by Chester county farmers. I can remember, before occupying the official position that I now occupy, of hearing of the magnificently equipped dairies here in Chester county, the best perhaps that can be found anywhere in this Commonwealth, if not the best in the United States.

I can remember, moreover, in my boyhood days of having the opportunity to see three of the finest herds of Shorthorn and Durham cattle ever brought into Somerset county, and they were brought from Chester county. The Jerseys and Guernseys have found their way from this county into the central and western counties of

the Commonwealth, therefore, you see I am not mistaken when I speak of your opportunities for diversified agriculture. You have these opportunities here, and I am glad to see that the farmers of Chester county know how to improve them. Why the fact that your lands have been under cultivation for over two hundred years and are richer to-day than they were a century ago, proves to us all that the farmers of Chester county understand their business, and so we are glad to be with you and accept this welcome from such a class of people as we find here.

Moreover, Mr. Chairman, we are not unmindful of the fact that we are here upon historic ground. You will remember that when in the youth of Moses, the Lord appeared to him at Mount Horeb, he was told to put off his shoes from off his feet, for the place upon which he stood was holy ground, and it is with a feeling somewhat akin to this which must have been experienced by the old Hebrew lawgiver that we come into your midst on this historic ground. We remember that the soil upon which we stand when we are in Chester county was baptized with the blood of our fathers in their momentous struggle for Independence. We remember that here some of the most important battles of the war that resulted in American Independence took place. We are perhaps not much more than half a dozen miles from the field of the Battle of Brandywine, where, on the 11th of September, if my memory fails me not, 1777, General Washington with the patriots that followed him, fought; and then just a little way on the north side of us is Paoli, the place where that memorable massacre occurred, only a few days after the battle of Brandywine. And then if we go just a little further off in a northeasterly direction, we come to Valley Forge, where perhaps the greatest amount of suffering and sacrifice was endured by our Revolutionary fathers, that was experienced through the eight years that the struggle for Independence drew its bloody length along, and so we are glad to be here because we feel that we are standing upon historic ground.

Some one has said that the plains of Moab speak to us across the ages, and so my friends it is with Brandywine and Paoli and Valley Forge. They are an inspiration to the lovers of liberty in every age and we are glad to be here. We are glad to be here where our fathers fought for Independence. But there are other reasons, if I had time to enumerate them, why we should be glad to be here and why we should appreciate this welcome. Chester county is not only a great agricultural county, is not only a great historic county, but it is a county that in the past has been great in its production of men. I think it was Wendell Phillips who, when he was visited once by some of his friends who lived some distance away from him, had his attention called to the fact that they had in his community.

in all sections of the country over which they traveled, remarkably good schoolhouses. His friend said to him: "I notice your barns are of moderate size, and that your houses are not extravagant in their architecture, but I admire your schoolhouses; they furnish a contrast to your barns." Mr. Phillips turned to him and said: "We raise men; we pay more attention to raising men than to raising cattle." And so while you have raised your Shorthorn cattle and your Guernseys, and your Conestoga horses, for I can remember when they were brought from Chester county up into the western part of the State, you have also been raising men, and we are standing here to-day where men such as Anthony Wayne, whose name adorns some of the brightest pages of our country's history, was born and reared. Only a few miles south of us is the home of Bayard Taylor, a statesman and a traveler and a journalist and an author, a man whose name will live while the English language is spoken or written in any land; and there are many others. I might name among them the Kents and Swaynes and the Cooks, and others who have added very materially to the literature of this Commonwealth, and of this country, and so we are glad, citizens of Chester county, to be here as your guests, and to express our appreciation of the welcome that has been so eloquently and forcibly expressed in the speech to which we have listened.

The CHAIR: Before proceeding with the program, I think Mr. Martin would like to make some announcements.

MR. MARTIN: As this is the opening session of our Farmers' Normal Institute, it would be but proper that at this session there should be appointed a committee on questions. As you are well aware, if this meeting is to be profitable to us, the interesting part—one of the most interesting for ourselves—will be the questions and the answers that may be developed upon the subject-matter of the topics discussed at the various sessions of this meeting, hence I take the liberty to appoint Mr. Norris G. Temple and Mr. George F. Barnes as an institute committee to distribute the blanks and gather up the questions, and we request that the persons who have questions they wish answered, will write them on these blanks, sign their names and address, so that we may know by whom they are presented. We make this request in order that when the proceedings are published, the name and address of the person handing in a question may also be published with the proceedings and with the answers.

I might state at this time, that to-morrow at twelve o'clock, through the generosity of Mr. Kates, the proprietor of the "Harvest Home Farm" some eight miles distant, we are all invited to be his guests, and transportation will be provided in front of the Hall to-morrow

at twelve o'clock to convey the members of this convention to that farm, and through the generosity of Mr. Kates we will partake of a lunch and hold our afternoon session there. The program will be just a little changed. If you will notice, Mr. Orr is on the program for an address on Poultry Breeding. His place on the program will be omitted and Mr. Schwarz will take his place. Mr. Orr's topic includes the exhibition of poultry here and cannot be given out at the farm. This, however, can be announced a little later. I think there is nothing at this time that I need to say, except to simply notify the members of this convention who have not yet registered, to come forward at the close of this meeting and register and receive a badge of membership. We will call no roll to-night, but this will enable us to make up the roll so that it can be called at the proper time.

From the register it was found that the following Institute Managers were present:

County.	Name and Place.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Millhall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Erie,	Archie Billings,, Edinboro.
Fayette,	Sylvester Duff, Smock.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warrior's Mark.
Indiana,	S. M. Henry, Indiana.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Volant.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstermaker, Allentown.

County.	Name and Place.
Luzerne,	J. E. Hildebrandt, Dallas R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D.
Northumberland,	I. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	J. B. Kirkbride, Bustleton.
Pike,	B. F. Killam, Paupack.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro.
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	{ George A. Woodside, Sugargrove.
	{ R. J. Weld, Sugargrove.
Washington,	D. S. Taylor, Raccoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	G. F. Barnes, Rossville.

Of the Institute Lecturers, the following were present:

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
 Beardslee, R. L. Warrenham, Bradford county.
 Black, W. C., Mercer, Mercer county.
 Bond, M. S., Danville, Montour county.
 Brodhead, C. W., Montrose, Susquehanna county.
 Brubaker, A. L., Hogestown, Cumberland county.
 Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
 Butz, Prof. George C., State College, Centre county.
 Campbell, J. T., Hartstown, Crawford county.
 Clark, M. N., Claridge, Westmoreland county.
 Conard, Dr. M. E., Westgrove, Chester county.
 Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
 Cox, John W., New Wilmington, Lawrence county.
 Cure, Z. T., Jermyn, Lackawanna county.
 Detrich, J. D., West Chester, Chester county, R. F. D. No. 12.
 Drake, W. M. C., Volant, Lawrence county.
 Foight, John G., Export, Westmoreland county.
 Funk, Dr. J. H., Boyertown, Berks county.
 Hall, Horace, H., Ellisburg, Potter county.
 Hantz, Prof. J. M., Merrittstown, Fayette county.
 Harshberger, J. W., Ph. D., Philadelphia.
 Herr, Joel A., Millhall, R. F. D., Clinton county.
 Hill, W. F., Chambersburg, Franklin county.
 Hoover, Hon. E. S., Lancaster, Lancaster county.

Hull, Geo. E., Transfer, R. F. D., Mercer county.
 Johnston, J. B., New Wilmington, Lawrence county.
 Kahler, Hon. A. J., Hughesville, Lycoming county.
 Ledy, J. H., Marion, Franklin county.
 Lehman, Amos B., Fayetteville, Franklin county.
 Lighty, L. W., East Berlin, Adams county.
 McDonald, John T., Delhi, N. Y.
 McDowell, Prof. M. S., State College, Centre county.
 Menges, Prof. Franklin, York, York county.
 Northup, Henry W., Dalton, Lackawanna county.
 Orr, T. E., Beaver, Beaver county.
 Owens, Prof. Wm. G., Lewisburg, Union county.
 Peachey, J. H., Belleville, Mifflin county.
 Philips, Hon. Thomas J., Atglen, Chester county.
 Schwarz, Hon. R. F., Analomink, Monroe county.
 Seeds, R. S., Birmingham, Huntingdon county.
 Stout, W. H., Pinegrove, Schuylkill county.
 Stuart, R. R., Callensburg, Clarion county.
 Surface, Prof. H. A., Economic Zoologist, Harrisburg.
 Wagner, F. J., Harrison City, Westmoreland county.
 Watts, Prof. R. L., Scalp Level, Cambria county.
 Waychoff, G. B., Greene county.
 Watts, D. H., Kerrmoor, Clearfield county.
 Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county

The following visitors were present:

Name.	Place.
Mrs. W. H. Howard,	Emporium.
Mrs. T. E. Orr,	Beaver.
Mrs. Norris G. Temple,	Pocopson.
G. R. Hendricks,	Selinsgrove.
Mrs. Wells W. Cooke,	Washington, D. C.
Horace Seamans,	Factoryville.
Wm. K. Miller,	Salem.
M. P. Hollowell,	Ivyland.
H. W. Hollowell,	Ivyland.
Alfred Hollowell,	Marshallton.
H. M. Wingert,	Fayetteville.
Mrs. H. G. McGowan,	Geiger's Mills.
Mrs. W. F. Beck,	Easton.
Mrs. M. E. Beck,	Easton.
Mrs. T. J. Philips,	Atglen.
Thomas Sharpless,	West Chester.
Edward Walter,	West Chester.
R. F. Lee,	State College.
E. L. McKinstry,	West Chester.
Thomas S. Butler,	West Chester.
Geo. A. Hoffman,	West Whiteland.
Victor Brinton,	Pocopson.
Miss Mary Seeds,	Birmingham.
Samuel L. Brinton,	West Chester.
Alva Agee,	Wooster, Ohio.
Henry Forsythe,	West Chester.
W. J. Johnston,	New York City.

Name.	Place.
Mrs. Samuel L. Bayle,	Fairview.
L. R. White,	State College.
E. F. Hay,	State College.
F. J. Zuck,	State College.
Henry Palmer,	Avondale.
Hon. Franklin Dye,	Trenton, N. J.
E. S. Bayard,	Pittsburg.
Miss Alma Kahler,	Hughesville.
Miss Grace Whiteley,	Philadelphia.
Wm. Howard,	Emporium.
B. F. Powell,	West Chester.
H. D. Ingram,	West Chester.
Chas. H. Pennypacker,	West Chester.
Mrs. Chas. H. Pennypacker,	West Chester.
J. E. Hoffman,	West Chester.
Mrs. M. A. Hoffman,	West Chester.
Samuel R. Downing,	Downingtown.
John I. Carter,	West Chester.
Hon. W. L. Amoss,	Benson, Md.

BURGESS PENNYPACKER: I hope that all those who possibly can will accept the invitation extended by Mr. Kates. You will see farming land in Chester county that has been continuously farmed for more than two centuries, and you will also visit or pass over some of the historic revolutionary ground in this county in going to his farm and returning from it.

The CHAIR: We are fortunate enough to have with us Miss Ethel Patterson, who will favor us with a vocal solo.

Miss Patterson, a member of Goshen Grange sang very sweetly, "Sweet Clothilde, Come With Me." Her accompaniment was played by Miss Kleinert, of Darlington Seminary. Being encored vigorously, Miss Patterson responded, by singing "Sweetest Lilli Fella," which was equally well received.

The CHAIR: You will now have the opportunity of listening to a lecture that is of infinite interest to all of us, "State Consumptive Camps and Cures," by Dr. J. T. Rothrock of West Chester.

Dr. Rothrock spoke as follows:

STATE CONSUMPTIVE CAMPS AND CURES.

BY DR. J. W. ROTHROCK, *West Chester, Pa.*

No case of consumption ever was cured by drugs. Now do not misunderstand me. I do not mean for one moment to underrate the important part that the medical profession can and does play

in the eradication and extermination of this disease. It is to trained physicians that we are indebted for the exact knowledge we possess of what the disease consists of. It is to trained physicians to-day that we are indebted for the best knowledge of the best means of treatment. But I believe that I have expressed the consensus of the best medical opinion when I say to you again, as I have just said, that no case of tuberculosis ever was cured by drugs.

I can very well remember fifty years ago of hearing my father, who was an honored country doctor, say, that if a certain patient of his could go into the coal regions, as they were called, that is, the places where charcoal was burned in the woods, that he would have a chance to get well. At that early day people recognized the fact that in these coal regions cures occurred. They attributed the good results to inhaling the fumes and the dust of the burning charcoal. We know that charcoal is carbon, and it makes very little difference so far as the irritation of the lungs is concerned whether it is in the form of charcoal or in the form of bituminous coal; in either case it is an irritant. This shows how close men may be to a great truth but not quite recognize it. What was the actual beneficial agent in this case? Those charcoal burners set up a little cabin where a mere screen intervened between the cold winter and the heat of summer, with an open fireplace and with a bare apology for a chimney, and whether they would or not, those who lived in those cabins, practically lived in the open air. There was the explanation of the whole thing—the open air. In 1873, I was acting as assistant surgeon of the United States Engineer Corps and we were then operating in Colorado. There were with me two men, one of them a very distinguished scientist; the other a private soldier. The former had been sent to Colorado with the idea that a life in the open air might help him. The diagnosis in the case of the scientist had been given by the most eminent authorities in New York City. The other case had been diagnosed by a most accomplished man and they had sent this private out to Colorado because they did not want to bury him at Fort Leavenworth. Both of these men are alive to-day. The one gained twenty pounds and took no medicine; the other gained forty and gained it in spite of the whiskey he drank. I could not help asking myself the question whether the beneficial effects of the open air were confined to Colorado. As a Pennsylvanian I came home and in 1876, placed a brother physician in the hemlock wilderness of Sullivan county. He stayed there in the open air without medicine and almost without care and in two months gained enough strength to return and continue his practice and then go to Cuba and die.

Now as Commissioner of Forestry, I found myself three years ago in charge of 600,000 acres of land. It belonged to the people of the

State; was purchased with their money and paid for by them. They were entitled, I felt, to every benefit they could receive from it, which was not in opposition to the purpose for which it was purchased, namely, forestry, and it occurred to me to see whether or not we could not open this Pennsylvania wilderness for those who could not go to California, or to the Adirondacks or to North Carolina. We have had in that camp ninety-four patients and we have sent away from there sixty-seven per cent. cured. There has not been a gallon of cod liver oil used, there has been almost no medical treatment. When I say sixty-seven per cent. cured, I mean actually cured or so far restored that their recovery is a question of time.

Now I have not a word to say against White Haven. I shall confine my remarks, however, to the work at Mont Alto. I recognize to the fullest extent the magnificent work and splendid achievement at White Haven. The results which have been accomplished there are such as any country may well be proud of. I say then, that pure air is the one active agent in the restoration of consumptives to health.

Now in our little mountain home, we had at first a few cabins made out of second-hand lumber. I hadn't a dollar to build with when we commenced this work. We tore down some old houses and carted them to the top of the mountain; a man who was willing to live in a building of that kind would not be a desirable resident on State land. I tore down these old houses and carted them to the top of the mountain, and begged the money to put up these cabins, ten feet square with a tarred paper roof, with two windows and a door, without a speck of carpet, with whitewashed walls, and then a coat of brown building paper over it. A stove and a lantern and a chair completed the outfit. Now I could tell you of cases from this county; one pale faced boy with death written all over his countenance, whose own mother said to me, "My son will not be alive in two months," but that same boy was sent home a short time ago, a ruddy, healthy boy, cured. We of course have had our disappointments, but the good results have enormously outweighed the bad ones.

I want to give you just a few cases, that I have in my mind now. One man came to us weighing 140 pounds, his normal weight being 180 pounds. He gained on the average seven pounds a week. He came to us saturated with malaria which had to be gotten rid of by treatment. After that, he had no medicine. He ate eggs and drank milk, and he consumed quantities of beef, which stagger belief—seven pounds a week. Another man came to us from over here in Montgomery county. He had been living out doors, living in a tent, but was steadily going down. After he came to us, in thirty-eight days he gained thirty-eight pounds and a half, and is now home at his business, well. Another case comes to my mind. A case which

had had so many hemorrhages that we doubted the expediency of receiving him. He had had hemorrhage after hemorrhage and was a mere wreck and shadow when he came to us. He was with us between two and three months and he gained twenty-five pounds and then left because he hadn't the means to remain longer, but he is now back again.

These are some of the cases that we have had there from which have worked out good results. If I had time I could cite other cases to you which would prove the good results of the open air treatment, but I want here to allude to the work that the women of the State have done. Last October I went to the camp from which I had been absent a few days and found that the inmates were in a freezing condition. Many of them were too poor to purchase wood; there was not a stick of wood in that camp. I did not believe that the Lord would allow work of that kind to fall through, and without the promise of a cent, without knowing where the money was to come from, I got on my horse and ordered wood right in; didn't delay a minute, and it came in and by night we had several cords of wood in and men at work to cut it, and from that time until spring warmed up the earth with the hearts of the people, we were never out of wood in our camp, when we didn't have anything in the way of fuel to keep that camp warm, and it was all due not to the benevolence of the men of the State, but every cent of it to the devoted women of this Commonwealth.

I want to say, furthermore, that when I started to build those cabins I hadn't a cent of money to build them with. I went to a lady in Harrisburg and told her what I wanted to do, and she immediately subscribed herself, and went out among her friends, and before twenty-four hours I had all the money necessary to put up ten cabins. I have now got more money for the running of that camp than I ever had before and every cent of it has come from the women of the State.

Now the location has something to do with the cure of consumption. It is true people can get well right in their back yards. There are many of them getting well there now right in this county. But location has something to do with it. Take for example the person I spoke of in Montgomery county who was steadily going down until he came to the mountain home at Mont Alto and gained thirty-two and a half pounds in thirty-eight days and is now permanently well. You asked me the question, are these cures permanent? My friends, in some cases they are absolutely permanent; in other cases it depends. Then you say, "Well, it depends." You might put that proposition in another way, my friends. Suppose you were condemned to be hanged to-morrow morning, and word was to come from the Governor saying, "I will reprieve you as long as you will live

outdoors." I think you would never die by hanging even if you were obliged to swelter in summer and shiver in winter. Some people may have to stay out doors. It may be necessary for them to do that to save their lives. On the other hand, persons may live in the best atmosphere the country affords and yet die with consumption. I have in my mind now a family of strong, hearty, vigorous people apparently, living right under the shadow of these health-giving mountains and yet every member of that family dies before they reach old age from consumption. Now why have they done that for generations right there in that healthy climate. Why have they done it? Because of the dread they have of fresh air. They are afraid of a draft, afraid to open their windows. Why the most delicate person we have had in camp is not afraid of a draft or an open window or the night air. Some people are so afraid of the night air, when the night air is the only air we have in the night; it is a mere bug-a-boo. There is nothing in it. It is only the person who lives in a close room, and perhaps over-heated and afterwards goes out into a cold temperature that catches cold. What sort of a man do you think that would be who could stand with not a moment's notice a translation from Greenland down to the equator? That is practically what you do everytime you go out of a super-heated house in the winter, and what can you expect? A person who lives out doors is the one who never catches cold.

Now why are these consumptive camps located on a reservation? I know there has been, to a certain extent, opposition to this, and opposition I may say on the part of the highest dignitaries of the State. In the first place, these reservations were purchased with the idea of forest restoration and they belong to the people of this Commonwealth. They were purchased for their interest and paid for with their money, and if there is any good that they can get out of these reservations without interfering with the purpose for which they were purchased, I think they are entitled to it.

Now there is another reason why these consumptive camps should be located on the reservations. A short time ago I proposed to purchase a piece of ground along the Brandywine for the purpose of opening a consumptive sanitarium, and I was not very long in finding out that the investment on my part would not be regarded with any favor with the neighbors. They didn't want a consumptive sanitarium there. I don't blame them very much. I would not like to have a contagious disease in the vicinity of my family if I expected to live there. Now the isolation that we have in these forest reservations is complete. We are interfering with the rights of nobody. Nobody wants to live there. We stand on an elevation and we look out over miles of forest land. There is not a factory chimney in sight, and every breath that you take in comes to you through miles

of foliage, and that is the place, if there is anything in environment, to put these consumptives. That is the place where they are the least trouble, and where they have the largest chance of recovery.

There is still another reason to be considered in the establishment of these consumptive sanitariums. We find that the question arises: What are we to do with those we have cured, or so nearly cured that they can be trusted to send out? We can't send them back into the cities, into the slums; because if we do, all this work will have to be done over; it is wasted. Why can't we have farms where these people can work out doors? Why can't they be put to work? There is no reason why not, but there they would be again a nuisance, an offense to the neighborhood. You have got to buy the farms, first of all. Now the State has got this land and we need people there to help fight forest fires in the spring, and to act as watchmen. We can plant basket willows and grow the materials to make baskets which can be sent out and sold. Millions of white pine ought to be grown every year for gratuitous distribution over the Commonwealth. These people can do that and earn their living and be out of everybody's way. It seems to me that it is a plan that would help everybody, hurt nobody and please God.

Now, my friends, I very well remember the time when we had in this country what we called the black plague. I do not mean the black plague of slavery which was cursing the country North and South, and continually acting as a bone of contention between the different portions of this land. I remember how the loyal hearts of the North arose, and ended the question forever, and we banished the black plague. Now the white plague of consumption is a plague which can be just as effectually banished as the black plague of slavery. Every time you go into your house off the street, you carry in the germs of this disease. You have got the poor victims of this disease scattered in communities and in hospitals; you can't get rid of it; the poor you have always with you. Wouldn't it be better to take hold of these cases in their early stage and restore them to the ranks of usefulness, of honorable, healthful citizenship? It can be done. Seventy per cent. of the cases of incipient tuberculosis should be cured. Ordinary attention to the hygienic rules and the prevention of spitting on the sidewalks, would tend to make the atmosphere so healthful that no case of consumption would ever be started.

I want to give you a little instance that came to my notice a short time ago. I was on a train where there was a lady with several children and one of them had a paroxysm of whooping-cough. The mother sent one of the children up to the cooler to get a glass of water, and that was brought down to the child with the whooping-cough and it took a drink out of the tumbler; then everyone of the others, three children, took a drink from this same tumbler.

and then the mother took a drink out of the tumbler and then the tumbler was placed back on the stand by the cooler. Now there are other diseases such as you are exposed to in similar ways, just as you are exposed to tuberculosis.

I think one of the best investments Pennsylvania ever made was the appropriation of \$8,000 for the creation and maintenance of this camp. It has taught the citizens of this Commonwealth who are too poor to go the required distance to health resorts and who are afflicted with this dreadful disease, that they can be cured. It has taught these people to look to the everlasting hills of this Commonwealth with hope and reasonable expectation that they may be cured. If it has done nothing else than to teach our people to live out of doors, it has done a noble work.

The CHAIR: We are now to be favored with another piece of vocal music by Miss Ethel Patterson.

Miss Patterson sang a ballad entitled "Tony and Dons," which was greeted with vigorous applause.

A Member: Doctor, will you please state the elevation of your Sanitarium at Mont Alto?

DR. ROTHROCK: 1,660 feet.

MR. CLARK: I have been very much interested in the consumptive lands in North Carolina and would like to inquire whether you have made any comparison with reference to the two places.

DR. ROTHROCK: I have not except in results. I believe that our results are about the same as in North Carolina. I should say this: Ours is simply a camp where we do not feed the patients. We have not the money to feed them. If we could give them at least one square meal a day, no doubt we could produce still better results, for everyone knows that the mere effort to prepare food, destroys the appetite. The question of cure for consumption is really a war between repair and destruction, so that it amounts to a question as to whether you can get food enough taken and assimilated to build up faster than you tear down.

A Member: What is the lowest altitude you would recommend?

DR. ROTHROCK: Patients sometimes get well at the level of the sea; on the other hand an excessively high altitude is often a very dangerous one. We had one young man who did not do so well as in Philadelphia, and he was sent to Colorado and died within forty-eight hours after he arrived there.

BURGESS PENNYPACKER. Won't you preach the gospel of more fresh air in the farmhouses of Pennsylvania?

DR. ROTHROCK: I would like to see the old fashioned fire-place that our fathers used to have, big enough to put a six foot stick of wood in, in every farmhouse in the land.

A Member: Doctor, do you consider that there is any virtue in cold; a cold temperature?

DR. ROTHROCK: No, I do not. I might tell you of a little incident. When the temperature was fourteen degrees below zero, I met a party of the inmates of my camp going out to have a picnic on the top of the mountain and they went out and stayed there all day, and they came back at night with their tongues out, and nobody was hurt by it, and one of the persons who was in that party was a very delicate lady, who afterwards came to West Chester and took a course of instruction and training as a nurse.

I want to say here that I had four representatives there from a family of thirteen children, the father having died with consumption and the mother with cancer. Eight out of these thirteen children were dead with consumption; one, a man, apparently didn't have it; never showed any signs of it; but four members of that family were in my camp and every one of them have gone away cured, and they have taken no medicine. They have eaten poultry instead of taking medicine; ate raw eggs, drank milk and breathed the fresh air. I believe in their taking this kind of food; all they can hold of it.

Now I am a doctor myself, and I want to say here, that I believe I express the sentiments of the best of our medical profession to-day, when I say that no case of consumption ever was cured by drugs. There are cases when medicine is best, but not for the cure of consumption. A consumptive may have various other troubles, and we may treat him for those and frequently do, and that is just where the skill of a trained physician comes in, but I think the majority of physicians have absolutely lost faith in drugs for the cure of consumption.

MR. RODGERS: Doctor, how do you prepare fresh eggs to make them palatable?

DR. ROTHROCK: I think the best way is to simply swallow them as you do an oyster. Just take them into your mouth and let gravity do the rest. Of course, you can flavor your eggs with anything you like, but we think that a patient who can take a fresh egg as he takes an oyster, is one of our best patients. Just break the egg into a tumbler, tip it up, and let gravity do the rest.

A member inquired as to Cod Liver Oil, to which Dr. Rothrock

replied that a pound of butter was worth more than a pound of Cod Liver Oil.

MR. SEEDS: Doctor, you spoke about the old fashioned fireplace. I would like to know if you have any objections to taking cold air from the outside, and putting it through a heater and forcing it up through the house.

DR. ROTHROCK: There is no occasion at all to do that. Why do they make the people in the Adirondacks sleep out with the thermometer twenty-five or thirty degrees below zero? Is there any virtue in cold? No, there is not. It is to make them get all the fresh air they can get. You can't live comfortably if your temperature falls a little below the normal. Such is the force of habit. The first effects of food are to create animal heat and if you live in a temperature twenty-five or thirty degrees below zero, an enormous quantity of that food has to go just to keep you warm.

In our little cabins, only ten feet square, a bunk is built on this side (indicating) and there are two windows, one here (indicating) and the other at the other side. A little stove is right at this window (indicating), when they put a fire in that stove on a cold winter night, it makes that room so hot they have simply got to open the windows and doors so that it lets the air sweep right through that cabin and when the man gets well enough he is made one of our forest wardens, out in all kinds of weather, fighting fire and doing all the work of the State on these forest reservations.

A Member: Doctor, is any more legislation needed to carry out the idea of this work?

DR. ROTHROCK: I think legislation will be needed. I think we have got to take care of these people. I think that the public sentiment, as it has been expressed, is very largely in our favor, and I think that the time is coming when these reservations will be largely used, and I believe that the finances of the State will be sufficient and will be provided to carry on the work.

BURGESS PENNYPACKER: Does the question of heredity have anything to do with the question of consumption?

DR. ROTHROCK: I think it does. I can't explain why, but I know that there are a certain number of children in some families who, one after another, when they get to about thirty years of age, will die of consumption. The question is, whether we cannot, by living in the open air, overcome the hereditary tendency.

BURGESS PENNYPACKER: I think you can, because my mother died with tuberculosis at fifty-four and I believe I do not exhibit

any signs of it at sixty. But we have had the gospel of open air discussed in our family for the last forty-five or fifty years, and we do not believe there is any danger in the night air, for as has been said, it is the only kind of air you can get.

On motion of Mr. Hutchison, duly seconded, a vote of thanks was returned to Dr. Rothrock for his able and instructive address.

The CHAIR: We will next hear from Dr. J. H. Funk, of Boyertown, on "Spraying: When, How and What For."

Dr. Funk's paper is as follows:

SPRAYING: WHEN, HOW AND WHAT FOR.

BY DR. J. H. FUNK, *Boyertown, Pa.*

To the fruit raiser who desires healthy trees with rich, luxuriant foliage, producing annual crops of clean, high-colored, luscious fruit, spraying is no longer an experiment, but as much an actual necessity as is fertilizing and cultivating the soil for the production of maximum crops. There was a time in the early history of our forefathers when the virgin soil was so rich in all the elements of fertility necessary for the best growth of root, stock and seed, that annual applications of manures was not necessary. The soil was full of humus, making it loose and porous, giving access to air and heat, absorbing and holding moisture, that maximum crops were raised with little effort and cultivation on the part of the farmer.

So it was with the fruit raiser. In those early days trees grew spontaneous, maturing fruit in abundance. There were not so many varieties of a high standard as at present, but such as there was (and some of it was excellent) grew without molestation from our insect enemies. Fungi was a thing unheard of by those early pioneers in horticulture. And the few insects that were native to our country were held in check by the feathered songsters that were so plentiful and made the forest and field cheerful with their bright colors and sweet music. But with the increase of population and advance of civilization the demand was made for more tillable land. Forests were devastated, destroying the nesting places of our feathered friends, and driving the various insects that subsisted upon the wild forest trees to invade our orchards and change their diet from the wild to our cultivated lands.

But this does not complete the story. Our country, this great, grand and glorious country where freedom abounds, has always

proven the home for the oppressed of every nation, and as they came pouring in through our open doors from every country they brought with them, not only their own individualities, but germs from Germany, microbes from Ireland and parasites from Paris, and insects from every nation. Our soil and climate proving congenial, they have multiplied to such extent that there is no crop but which is more or less infested and it has become a matter of the "survival of the fittest." He who expects to raise fruit or any other crop on the principles of our ancestors, will find he is up against the real thing; and to become master of the situation he must bestir himself and resort to spraying.

This subject has been so much talked about that you can scarcely pick up a paper, agricultural or horticultural, but you see articles on spraying. Yet it has never been placed in such a light as to fully impress the average mind with its importance. It is claimed there is an annual loss in the United States alone of between 300 and 400 millions of dollars, and that 75 per cent. of this loss could be avoided by judicious spraying. Fruit especially claims more attention than formerly as our insect foes are increasing so rapidly. In the Scriptures we read of the plagues of Egypt. They were scarcely more terrible than the vast army of creeping, crawling and flying insects that have been imported, developed and disseminated, that are biting and sucking and thus destroying the vitality, beauty and luxuriant growth and wealth of fruit. Some of them are sucking insects and must be killed by contact remedies such as L. S. S. soap-suds, kerosene emulsion, crude oil, etc., any oily substance that closes up the breathing pores along the sides of their bodies. Some are masticating insects, eating the leaves, the tender new growth and the fruit. These can be killed by internal poisons, such as arsenite of lead, arsenite of soda, Paris green, hellebore, etc. We frequently hear of dissatisfaction caused by using fungicides for masticating insects, and vice versa.

Insects are classed under two heads: Biting and sucking. Under the first class we have the caterpillar, canker worm, codling moth, cut worms, wire worms, potato beetle, etc. In sucking insects we have the scale insects, aphids, chinch bugs, etc. So we have with fungus growths wherever it attaches itself on fruit, it prevents the development by sapping the juice or, if on the leaves, it destroys the cellular tissue and prevents the leaves from performing their function, that of preparing the plant food. Leaf blight or scab fungus causes the leaves to drop and the fruit on such trees cannot properly mature. These are best treated with fungicides of which the copper salts are the best.

What is spraying? The forcible ejection of fungicide or insecticide ingredients in such fine or minute particles, whether dust or

misty spray, that it will be thoroughly distributed through every part of tree, bust or vine, leaving no part uncovered or uprooted from the ravages of insects or infection by fungi.

When shall we spray? Fruit, for scale, fungi, leaf curl, etc., while the tree is dormant, anytime after the leaves drop in the fall of the year until the buds expand in the spring. At this season the tree, having no foliage to distract, every limb and twig can be reached by the spray, thus destroying all insects and fungi much better than in summer.

For masticating insects, the best time is just after the bloom drops. It might be done while in bloom, but it does in some instances interfere with proper polinization, and destroys one of the best insect friends the fruit raiser has, the honey bee. Wait until the petals fall then spray at once, as the time is short between the dropping of the petals and the closing of the calyx, and a few days delay would be fatal to success. That this second spraying should be done at just the right time is very important, as far as the codling moth is concerned; and should be done inside of ten days, as after the calyx closes it prevents the lodgement of poison, which to be effectual, a small portion must be inside the cavity. The codling moth passes the winter in the pupa state. At the proper time in the spring it is transformed into the moth miller which lays its eggs on the small fruit or nearby leaf. As soon as the warm sun hatches the young insect, it seeks shelter by crawling into the closed calyx and there takes its first meal. If any poison is there its career is soon ended, but if not, then the young worm feeds a few days in the cavity before tunneling into the core of the fruit, which soon loses vitality, becomes yellow and falls to the ground. The larvae then eats its way out, seeks some secluded place, spins itself into its cocoon, passes the pupa stage, and again emerges and produces the second crop of codling moths, showing the importance of doing effectual work in the spring.

There is more failure through lack of thoroughness than almost any other cause. You need not spray until it drips from the foliage and runs down the limbs and trunk, but every part must be thoroughly moistened. Many orchardists do not know what thoroughness means. A short time back I read an article in a horticultural paper by a fruit grower in the West, stating that an orchard of 20 acres can be best treated by a hand pump, but for larger orchards by using a sprocket gearing attached to the wheel, a pressure of from 80 to 120 pounds could be maintained, and with such a machine with two lines of hose, 4 nozzles, two men and one boy, from 60 to 100 acres could be sprayed in one day. This is very nice in theory, but when you endeavor to put it into practice you see the fallacy. For instance, one acre planted 35 by 35 gives 35 trees per acre; 100 acres

gives 3,500 trees. An average tree of 20 to 40 years of age takes 5 gallons at least; that means 16,500 gallons. Now any machine that will throw that amount of material through 4 nozzles is better calculated to put out fires than spray trees.

Let us see what the capacity of a machine is and we will take one of the best, one run by liquid gas with which you can maintain a uniform pressure up to 125 pounds. We will equip this machine with 8 nozzles instead of 4. We will run a uniform pressure of 100 pounds and the utmost that can be forced through the small cap vermorels (and these are the only ones making a perfect mist) is 100 gallons in 20 minutes; that means 300 gallons per hour or 3,000 gallons in 10 hours (any man who has properly handled an 8 or 10 foot extension pole, thinks 10 hours constitutes a legitimate day's work), less than one-fifth of what this man calls for.

Why do editors permit such nonsense to get into their columns? It does incalculable harm, encouraging the beginner to hurry over his trees, wasting his time, money and doing his trees but little good. It is an utter impossibility for any orchardist to spray 10 acres per day and do a good job with one machine; and any machine that does more is better calculated for a road sprinkler or a fire extinguisher. When you see an advertiser guaranteeing his sprayer to spray from 50 to 100 acres per day, pass it by as worthless for your purpose.

What are the results of spraying? It is claimed that any man who has more than 10 per cent. of wormy fruit has not properly sprayed. This I believe to be practically true. To see if this is true, let us investigate the results obtained by careful experiments as carried on at different stations.

By the Geneva Experiment Station, several orchards were sprayed at different localities, widely distributed, to render results more conclusive, as environments often affect results. Number of trees sprayed with sulphur washes were 7,325, consisting of apple, pear, peach and plum. The washes used were the boiled sulphur wash and the self-boiled lime, sulphur, caustic soda wash.

Results on peach. These trees were infested with San José Scale. The self-boiled wash was used. Careful examination on October 1st failed to reveal any living scale. For peach leaf curl, with exception of a few terminal buds, the sprayed trees were practically free from curl, whereas the unsprayed trees were much defoliated and the trees were in unthrifty condition.

Pear. Applied from 9th to 20th of April, the sulphur wash destroyed the blister mite, also lichens, and left the bark clean, and foliage set after June 15th was still adhering October 20th, while the trees unsprayed were nearly bare.

Apple. On 276 trees, 30 to 50 years old, spraying was begun with

the sulphur wash April 7th, continued until April 12th; work delayed every day by rain. Bordeaux arsenical mixture was applied May 18th to 20th, June 2d to 6th, and July 6th to 8th, rainy weather during most of the spraying time. With the picking of the fruit, September 27th, the apples were carefully examined with respect to scale, codling moth and scab.

The outline of their experiments were as follows: Section No. 1, sprayed once with sulphur wash; Section No. 2, sprayed once before buds opened with sulphur wash, and twice after drop of petals with Bordeaux and arsenical poison.

Section No. 3, no treatment.

Section No. 4, sprayed three times with Bordeaux and arsenical; once before and twice after blossoms dropped.

Average of wormy fruit on Section No. 1, 27.6; average of wormy fruit on Section No. 2, 3.6; average of wormy fruit on Section No. 3, 24.3; average of wormy fruit on Section No. 4, 8.9; sound fruit from trees treated with Bordeaux arsenical mixture averaged 93.8 as compared with 74.1 per cent. sound fruit from checks and where treated with sulphur wash alone. The application of sulphur wash greatly reduced the number of scales and gave fruit practically free. The average of infested fruit from sulphur treated trees was 5.3, as compared with 17 per cent. of scaly fruit from untreated trees.

In every instance where the work has been properly done the results have been very satisfactory for scale insects, codling moth and scab.

The Connecticut Experiment Station has likewise been experimenting for several years with different sprays. With the L. S. S., boiled and self-boiled, both have given good results, but on the average, best results have been obtained from the boiled preparation. At the Paragon Fruit Farm we have been spraying for several years, mostly for scale, having tried various sprays with remarkable success. Our preference is for the lime, sulphur and salt, boiled. With this we have been able to hold the pest in subjection; so much so that we no longer fear it. We have had trees so badly infested as to be considered hopeless. We not only saved these trees but completely eradicated the scale without the loss of a single crop of fruit and regained the thrift of the trees. Last fall we purchased a new spraying outfit and wishing to test it, we boiled 100 gallons of L. S. S. and sprayed a portion of the orchard that was infested. The day was very cold and windy, so we could spray only one side of the trees. This was done on November 25th. Upon examination this spring we found no living lice beneath the scale on the side sprayed, but on the opposite side and upon the under side of limbs where the spray did not come in contact with the scale, we found plenty of live lice, thus showing that when the work is rightly done

it is immaterial at which season, fall or spring, the spraying is done.

How late can we use L. S. S.? This spring the weather being unfavorable, we did not finish our apple spraying until buds were expanded so far you could see color of petals. This did some damage to buds causing greater part of blossoms to drop, but did no damage to trees.

We sprayed 20 acres of apple orchard between March 25th and April 15th; also sprayed 150 peach trees with the lime, sulphur, salt wash, but as buds were swelling we feared to continue with the peach, thinking it might injure our crop, so we sprayed about 10 acres with Bordeaux Mixture No. 1. This was to prevent leaf curl. The results were surprising. Those trees sprayed with L. S. S. had no curl, while those sprayed with Bordeaux, many were very badly affected and lost greater part of foliage, especially Matthews' Beauty and Elberta, Belle of Georgia, Highly, Kalamazoo and few others were affected to a less extent. As soon as we saw the trouble we again sprayed the entire orchard with Bordeaux mixture, 2-5-50, and checked further trouble and the majority set a very fair crop of fruit, but will need but little trimming as the June drop thinned them about right, but those so badly affected, although they are now refoliated and making fine growth, have set but little fruit. I feel confident had we sprayed the entire orchard with L. S. S. the trouble would have been avoided and all trees would have had a heavy set of fruit. The third spraying will be given the peach about June 22d, and again about 10 days later, to be followed by more spraying as circumstances seem to demand. These latter sprayings will be to prevent fly-speck, fungus and wilt on the fruit.

To the practical horticulturist, details become monotonous, but I find the average farmer who has done little, if any spraying, wants details. You would be surprised to see the number of letters I get from farmers and fruit raisers asking questions that have been given time without number; but it goes to show that the average man gives little attention to the detail part until he is ready to make use of it, then finds himself stranded. So I hope I will be pardoned if I go into a few details.

I find that Bordeaux mixture, one of the oldest and most used of all the spraying mixtures, is as little understood as any. One-half who use it do not know if it is to kill scale, codling moth, fungi, or is to fertilize the tree. Not one out of every 10 knows how to properly make it; not one out of 25 knows what it is. The majority think it is a mixture of sulphate of copper, lime and water. We admit that is what you started with, but a chemical change has taken place, and we have sulphate of lime (gypsum) and hydrated copper, two insoluble compounds. So Bordeaux mixture is these two com-

pounds mechanically suspended in water. The sulphate of lime is so heavy, it quickly settles and carries the hydrate of copper with it to the bottom, therefore, it must be kept agitated. Now when this is properly made it will remain suspended three times as long as ordinarily made.

To make Bordeaux mixture requires 3 barrels. In one put 25 gallons water, place 6 pounds sulphate of copper in a sack and suspend it in this, then slack 4 pounds fresh burnt lime in another barrel and add enough water to make 25 gallons, then place a sieve over the third barrel and pour the copper solution and lime through it simultaneously. This makes a Bordeaux mixture that will give best results. This is a fungicide only, but by adding Paris green or arsenite of lead or arsenite of soda it acts as a fungicide and insecticide.

Arsenite of Soda. This is the cheapest insecticide and can be made by the farmer himself. Take 2 pounds white arsenic, 6 pounds sal-soda, boil in 1 gallon of water until dissolved, put in a gallon jug, add enough water to make 2 gallons. One pint of this is equal to 4 ounces of Paris green, and much more reliable as it will remain suspended longer being finer than the Paris green.

Lime, Sulphur, Salt. This is a specific for San José Scale when rightly made and applied. My formula is: 60 pounds lime, 50 pounds sulphur, 25 pounds salt. In a large kettle, put at least 30 gallons water, and while this is coming to a boil, weigh out your ingredients, place the sulphur in a tight barrel, add sufficient boiling water to make it by stirring into a thin slop, then put the lime into the boiling water (about 20 gallons) in the kettle when it commences slaking, immediately creating an intense heat, pour in the sulphate at once and with a stout paddle keep the lime from burning fast to the kettle. This soon settles down to a steady boil. continue stirring and boiling until you have the chemical change complete. This may take from 30 minutes to one hour. When it has gone through the various changes of color, from yellow to orange, then to dark brick color, it is complete, remove and pour through a sieve into the mixing tub and dilute to make 150 gallons. It then has a greenish yellow color. This should be applied while warm as it works better. Never leave it stand over night or it throws down sliver like crystals, hydrosulphide of lime Ca (S H)_2 , and then the wash has but little value unless the crystals are redissolved by boiling. The value of lime-sulphur-salt is due to two main factors, its causticity, which acts upon the scale as a contact remedy, and its mechanical property acting as a deterrent, preventing the young from attaching themselves.

Lime, Sulphur and Caustic Soda Wash. Lime 100 pounds, sulphur 50 pounds, caustic soda $12\frac{1}{2}$ pounds, water 150 gallons. The lime

is put in a tight cask and slaked with hot water, and when giving off considerable heat the sulphur is added; the caustic soda is then added and the whole well stirred, water being added as needed. The mixture is then diluted to make 150 gallons. This has given fair satisfaction, but owing to so much useless lime it is harder to work. When properly made the boiled mixture is the best and cheaper. The new preparation, Kero limoid, is being tried this season, but so far has not given the best satisfaction. If not properly emulsified it has in many instances badly injured the trees. Like all preparations containing oil, it must be used cautiously, as it is not good material in careless hands. Whale oil soap is a pretty sure a remedy if applied while trees are dormant; two pounds to one gallon of water, but it is expensive and destroys many buds. Dust sprays are being used in many sections, but they must be used while dew is on trees. They have not given satisfaction.

Machinery varies according to the demands. For shrubs, bushes and small trees a knapsack sprayer is sufficient; for a few larger trees a bucket pump can be used, but for a small orchard up to 5 acres a good force pump with a large air chamber is needed. Mount this on a barrel or tank and have a good strong man to pump; have a hose not less than 40 feet, a bamboo extension pole with a group of Vermorel nozzles, will give very good satisfaction. But for large orchards you want a power pump. There are many made that are of merit. In 1904 we used gasoline power, having a light, double cylinder upright engine mounted on a low down wagon connected to pump by means of pumping jack. With this machine we could maintain a very good pressure and did good work, but it had many faults. It was heavy and noisy and we had to use a pump and safety valve, and using the lime, sulphur and salt spray under pressure they were always out of order, the wash eating the brass that we could not maintain equal pressure, so we wanted something better, and hearing of the machine run by liquid gas, doing away with all pumps, I decided to try one, so in fall of 1904 I purchased one, and this seems to fill the bill. We have used it this season on 30 acres of orchard giving three sprayings, and the longer we use it the better we like it. It does away with all the hard, disagreeable work and does away with wear and tear of pumps. Its very simplicity recommends it. It consists of a tank of steel holding from 50 to 200 gallons, with an opening in the dome for putting in the liquid, which is then closed. There is also a gauge to show the pressure, a safety valve set at 125 pounds. This is connected by a strong rubber hose to the liquid gas tube, which is a steel tube containing 50 pounds liquid gas, put in under very heavy pressure, which condenses the carbonic gas into a liquid. When your tank is closed you turn on the gas to any pressure you want. We generally run from 80 to

100 pounds pressure; of course, the higher the pressure and the finer the nozzles the more misty the spray. The hose attachment is in the rear at bottom, and between the tank and hose attachment is a nozzle protector, which prevents any sediment from getting into the nozzles. You can attach one or four lines of hose with four or sixteen nozzles and maintain a steady pressure, doing more and better work than any machine I ever saw. The machine I am using, is the Niagara Gas Sprayer.

The permanent part of my outfit consists of a series of platforms against a side hill. A roadway is graded below the first platform, which is of sufficient height that all material can be run by gravity from the mixing tubs into the spraying machine mounted on the low down wagon. On this first platform is placed two large mixing tubs holding 160 gallons each. These are fitted with $1\frac{1}{2}$ inch gate valves and pipe to convey material to machine. On same level is one large kettle holding 75 gallons, in which we boil our mixture, and another boiler holding 150 gallons, in which we boil water. Above this is another platform on which is a large tank holding several barrels of water. From this, water is conveyed by one-inch hose to kettles, tubs, spraying tank, etc.

BURGESS PENNYPACKER: Dr. Funk, what will destroy the San José Scale?

DR. FUNK: Lime, sulphur and salt is infallible when properly prepared and properly applied.

PROF. SURFACE: When do you make your first application for San José Scale?

DR. FUNK: The first spraying should be while the trees are dormant. The second spraying should be done immediately after the tree blossoms or as soon after as possible. If you spray a few days too soon, while the blossoms are open, you do an injury to a certain extent to the pollenizing of the bloom. Furthermore you poison one of the best friends of pollenization we have, the little honey bee. If you leave it a little bit too long, what do you do? The calyx closes. My friend, Mr. Hall, from Potter county handed me that apple bloom to-day. (Exhibiting one.) You see that is in full bloom. That comes from a little south of latitude 42. We are here in just a little more than latitude 40. I want to show you the difference in regard to the apple. Now what I want to illustrate in spraying is this: The calyx is open and turned downwards. If you spray at this time, a small portion of that poison will get right in that open calyx. Now anywhere in from 8, 10 or 12 days after the petals have dropped, that calyx closes, draws in, just as if my thumb and finger were to close in this manner (illustrating). Now why does that make a difference?

The codling moth passes the winter in the pupae stage and at the proper time it will come out and lay its small egg in this apple or on some leaf in close proximity. That little microscopic piece of work is now accomplished and finds a secure hiding place.

BURGESS PENNYPACKER: Does the use of spraying destroy the gypsy moth in Massachusetts?

DR. FUNK: To a certain extent, but they never had sufficient means to carry that out, as I understand it, as they should, but where they used the arsenite of lead, wherever they used it effectually, they kept it in complete subjection in spite of all obstacles, and it is a pest that is if anything rather worse than the San José Scale.

(Holding up a sample of fruit, and naming it the Stamen Wine-sap.) I want to call your attention to this fact. There are gentlemen right in this house that saw these trees on which this fruit was grown, that I am referring to, and last fall a year, they were so completely infested with scale that you could not touch any part of the bark but what you could scrape up the scale. The whole bark was red, and continued red a quarter of an inch into the wood. The heavier limbs last spring were thoroughly sprayed. We thoroughly sprayed these limbs with lime, sulphur and salt and now you can't find a single scale on those trees. We followed up the first application in due time and in about ten or twelve days later we gave it a third spraying, and I propose this summer to carry out an experiment and copper plate them; that is what you may call it, as they do in Oregon, where they get the finest fruit there is in the world. I shall use the following formula: 65 pounds of lime, 50 pounds of sulphur, 25 pounds of salt, and 150 gallons of water.

A Member: Slacked or unslacked lime?

DR. FUNK: You want fresh lime, the very best that you can get. I have here on platform (indicating his method) a place where my wagon comes along, right on this first platform which is level with the ground. I have here a kettle holding 75 gallons. I have another large boiling concern that I can boil 150 gallons or more in. I will fill that 75 gallon kettle very nearly full of water. I weigh out my material and I will put my sulphur in that barrel (indicating) and put sufficient boiling water in it, and stir that up until I get it into a thin slop. I will put about 20 gallons in my boiler and keep that boiling without any check-up, then I will put the whole amount of lime in there, and the moment it is put in there it will start to boiling furiously.

At this time a representative of the street car company of West Chester extended an invitation to the members to visit Mount Bradford, and view the scenes of the Battle of Brandywine.

The CHAIR: How would it suit you, the day after to-morrow at one o'clock—Thursday?

MR. WALTERS: For anything that I know, that would be satisfactory.

MR. STOUT: Let me suggest that we change the hour from one to four, after our adjourning hour, because it will break in on the session here very much if we go at one o'clock.

MR. MARTIN: The suggestion of Mr. Stout is a good one. We will hold our session Thursday afternoon a little earlier in the afternoon, say we begin at one o'clock and then adjourn promptly at four, then we could take the trip which we are so kindly invited to take by Mr. Walters.

On motion, duly seconded, it was agreed that the time be fixed to make the trip above referred to, at four o'clock on Thursday.

PROF. SURFACE: Mr. Chairman, concerning an application for the San José Scale from now until the leaves fall, I will say that the lime, sulphur and salt must be applied when the foliage is off the tree. Now what can we use in the way of a remedy at the present time, before the leaves begin to drop this fall? What can we do? I would advise the use of a thick soap solution, whale oil soap being the best; that will kill it. Any thick solution of soap will do, using two pounds in one gallon of water. While I am speaking of the lime, sulphur and salt wash, I should make a little amendment to what Dr. Funk has given us; that is all right for him, but he is using a spray pump with an immense pressure which is not within the reach of everybody, consequently you cannot use a solution as thick as he recommends, for you must use a hand pump. A very good and effective formula is, for 150 gallons of water use 25 pounds of lime, 17 pounds of sulphur and 15 pounds of salt. That can be forced through an ordinary hand pump and will answer the purpose, although it is not so strong as he gave.

A Member: That is stronger than his.

PROF. SURFACE: Is it? I do not so understand it. At all events the formula I have given will do the work and can be used with the ordinary sprayer or hand pump.

MR. GLOVER: Dr. Funk, how would you treat apple and pear trees infected with scurfy scale?

DR. FUNK: A few years ago I had a great deal of scurfy scale in my orchard. Since I have been spraying with the lime, sulphur and salt, I have not seen a single tree left infested with the scurfy scale, showing that this wash is just as effectual for the scurfy scale and

the oyster shell bark louse, although through the winter there is an egg there instead of a living louse, but I find it destroys them just as effectually as it does the tent caterpillar egg right around the root of a tree.

MR. MCGOWAN: Will a continuance of spraying yearly with the Bordeaux mixture have the effect of destroying the San José Scale?

DR. FUNK: It will not.

A Member: I would like to ask the Doctor whether we cannot use something that is more easily prepared than the lime, sulphur and salt for the scurfy scale.

DR. FUNK: My men who help to spray say they would rather prepare a spray composed of lime, sulphur and salt than they would the ordinary Bordeaux mixture, with the conveniences we have. Everything runs by gravity right in our machines.

MR. GLOVER: Will ordinary white-wash kill the scurfy scale?

DR. FUNK: No, so far as actually killing the scale is concerned, it will not do it. I know of instances where trees have been painted, and painted thoroughly with the pure lime wash, but it will not do it.

MR. MCGOWAN: How much Paris green shall we use for 45 gallons of water in the Bordeaux mixture?

DR. FUNK: I am not using Paris green alone. I am using one quart of the arsenite of soda, a quarter of a pound of Paris green to a hundred gallons. If I was using Paris green alone I would use about three-quarters of a pound to a hundred gallons of Bordeaux mixture.

MR. J. W. COX: What is the proper way to prepare the Bordeaux mixture?

DR. FUNK: When I prepare Bordeaux mixture I want to begin ordinarily with three barrels. I want in the one barrel—I am giving it now to make fifty gallons—in one of my outside barrels—I will have three barrels in the lot—in the one outside barrel I will put 25 gallons of water. It depends of course, upon what mixture you want to make. In the Bordeaux mixture we have Nos. 1, 2 and 3. Suppose you want it, say, for potatoes, in which we use six pounds of sulphate of copper. We put it in a bag so that it is merely covered with water. If you throw it right in the boiler it will form a saturated solution and it will not dissolve for a good many hours; then you will take four pounds of lime and you will slack this with hot water, then run this through a strainer into the other outside barrel and add sufficient water to bring that up to 25 gallons. Now you have got this in the most diluted form that

you can get it and then put it through a strainer. I have a strainer made out of four inch white pine and I will put that right over the middle barrel generally, so as to do it conveniently and thoroughly. It is so thoroughly and intimately mixed by this method that you get the very best compound that you can make. You will find by that method of preparation that you will get a very much better mixture than you will get by pouring one right into the other. It is very simple and yet it pays to take that trouble.

A Member: Will that combination do for the apple trees?

DR. FUNK: Well, I will say that I use 5 pounds of lime to 50 gallons.

MR. ESCHBACH: How long will it take San José Scale to kill the apple trees?

DR. FUNK: That depends upon how thick they are on. It is surprising to any one how thick they will cover the tree. You may have a tree entirely free from it this spring, and by this fall you will find it so completely covered that you will find the terminal limbs all beginning to die off and one more season will finish it entirely, right down to the stem.

MR. J. B. JOHNSTON: Is there any successful machine for spraying Bordeaux mixture in dust form?

DR. FUNK: I have had no experience with the dust form of spraying; in fact I do not think that in commercial orchards it will ever be a successful thing. In the first place, to be beneficial we would have to use it in the morning while the dew is on the tree or you will find it will have but little benefit; but those that are using it, employ different machines, and they claim fair results. I understand that the Illinois Horticultural Society has condemned it as of no account. For myself I can give no personal experience because I have never tried it.

Mr. McGowan handed up a twig to Dr. Funk with the inquiry whether it was infested with the scale.

DR. FUNK: (After examining same.) Yes, there are plenty of them there.

MR. MCGOWAN: I have two trees out of five hundred just like that.

MR. DAVIS: Would it be practical for a man to have a machine and go around spraying so as to make it pay?

DR. FUNK: Yes, and no. There are sections where they are doing it and doing it with fair satisfaction. The only trouble is this: The season of the year is comparatively so short, unless a man com-

mences right in the fall of the year as soon as the foliage drops; then I believe it would be practicable. I believe where there are numerous small orchards he could get all the work he would want to do, and I believe that the average farmer would be willing to pay such remunerative prices that it would pay a man to get a suitable outfit and take up the business.

MR. RODGERS: What is the probable cost of spraying orchard trees where the trees are about 25 years old?

DR. FUNK: It will cost you about fifteen cents a tree. It depends upon the planting of your orchard. If you have got it about 30 by 30 you would have there about \$7.50.

A Member: For each spraying?

DR. FUNK: No, that would give you three sprays.

MR. ESCHBACH: What would you use for the currant worm?

DR. FUNK: There is nothing better than to dust them with the white hellebore, although when we are spraying our orchard, I have a row of currant bushes, and I put the Bordeaux mixture right over them and it thoroughly cleans them out. When the currants are grown up you won't find anything on them. I generally use the white hellebore. It takes but a very little bit.

COL. DEMMING: There are several present who have been members of this Board, connected with it in some capacity since its organization, nearly thirty years ago. They will agree with me, I think, that this has been the most complete and satisfactory statement in regard to spraying that we have ever had since the existence of this Board and it would well pay the State of Pennsylvania to have what has been said here to-night printed in pamphlet form and sent to every farmer in the State.

MR. MARTIN: While we altogether agree with this suggestion, I may say that it is the intention to have the proceedings of this meeting published in bulletin or pamphlet form, in such numbers as to make them available to the farmers of the State who desire to use them.

After announcement by the Chair as to to-morrow's program and an earnest request that all be present to get the benefit of the meeting, the Institute adjourned until to-morrow morning at nine o'clock.

Memorial Hall, West Chester, Pa.,

Wednesday, 9 A. M., May 24, 1905.

Second Vice President, S. S. Blyholder in the Chair.

DEPUTY SECRETARY MARTIN: My friends, we have a bright day and the prospect of a very busy day before us. Before we enter

upon the program proper, we deem it best at this time to appoint a committee on resolutions, and we will name as that committee, the Hon. Wm. Brosius, of Lancaster county, Mr. D. A. Knuppenburg, of Wyoming county, and Mr. L. W. Lighty, of Adams county, to serve as a committee on resolutions.

Our Institute is especially favored at this session by the presence of a number of visitors from other states and organizations. We see with us this morning Dr. Franklin Dye, of New Jersey, Secretary of the Board of Agriculture and in charge of the Farmers' Institute of that neighboring state. I know you will all be pleased to meet Mr. Dye this morning if he will just come forward and make a few remarks for our benefit.

ADDRESS.

BY HON. FRANKLIN DYE. *Secretary, Board of Agriculture, N. J.*

Mr. Chairman, Ladies and Gentlemen: As the young lady said, this is altogether unexpected, and I do not think, Mr. Chairman, that it is the best thing, because, as you have just intimated, you have a very busy day before you and a large program to work off. I am not an official doctor in any form by name, nor professor, I am simply Franklin Dye. I am glad to be with you, my friends. I was here last evening and could have said something then perhaps more appropriately than now.

You will recall the expression of one of the speakers who made an address last evening and touched somewhat upon matters political. I am so glad there are indications of an arising light in Philadelphia and Pennsylvania, the light of purification. We set you an example in that direction several years ago in New Jersey when we had to rid ourselves of the race-track business. We are trying to behave ourselves over there now.

I endorse the sentiment that the farmers are the foundation of national stability as well as of wealth, and I think, my friends, there is nothing egotistical in saying that. We can admit that fact as farmers, and admit it seriously and feel that upon us is laid a very great obligation. We represent more property, more wealth than any other class in the country. Its running capacity is greater, so great indeed, that we can run a Presidential election without regard to Wall Street, and the farmers, if they are prosperous, if they are doing well, can control matters with perfect safety. We want to keep our farmers right, morally, intellectually, if you please, right on these great questions, so that when they are sprung upon us,

particularly in the cities that are dangerous to Republican and Democratic government, we shall have this great body of farmers throughout the country and if we have them right and united, our old Government will forge on for centuries to come. So, my friends, let us try, not only to be right, as we are advancing in agricultural work, as we are all trying to do, but let us try to be united more than we are. I think we do well to emphasize that point. Let us through our several states and counties and several cities endeavor to have the farmers united, because if they are not united we never will accomplish what we want to do for ourselves and for others.

I hope to enjoy your program, and was glad to meet so many of my fellow-workers here. I wish you every success, and hope that the good things will radiate over the river into New Jersey as well as westward into Ohio.

DEPUTY SECRETARY MARTIN: The Division of Farmers' Institutes in Pennsylvania has always recognized and appreciated the help and strength given agriculture by the agricultural press of the nation. We have with us this morning a representative of one of the strongest agricultural papers in the land, *The American Agriculturist*, Prof. Wm. J. Johnson, of New York. I know you will appreciate listening to Prof. Johnson for a moment.

ADDRESS.

BY PROF. WM. J. JOHNSON, *Editor, The American Agriculturist, New York.*

Mr. Chairman, Ladies and Gentlemen: When I came in the door your worthy Chairman asked me if I would make a few remarks. As you all know, I am always ready to respond to such an invitation. If Mrs. Johnson were here, she would probably tell you that I am not only ready to make a few remarks, but usually desirous of having the last word. I am sure it will not be the case here. What I have to say will be very brief indeed. I wish to extend to you a hearty greeting as a representative of the agricultural press; hearty sympathy with you in the work in which you are engaged. It makes little or no difference where you find us working. We, as your worthy Secretary has said, are united in this one proposition, that the one great movement in this country to-day, so far as the farmer is concerned, is one of education.

I have come to believe since I left the old Ohio farm, about twenty years ago, that we are now just beginning an era when the education of the American farmer will see more progress during the next ten years, than it has in the last fifty. That may seem a

very strong statement, but I believe it is true. I mean by this just such work as is being done here in this State and in the various other states, through the selection of the very best and most practical men, who have been working and solving these problems on the various farms and are coming together annually and discussing their success; in this way becoming farm missionaries, practically reaching out into the field and giving their brother farmers and co-workers a helping hand where they need it.

As I have mentioned before, you have one of the most concrete examples in this State that we have in America to-day in the great work that has been accomplished by your fellow-worker, Mr. Detrich. I am glad since I came in this hall that we are to be given an opportunity of going this afternoon to the place and there seeing for ourselves the farm of 340 acres, which in less than a year has been converted from a worn out and abandoned farm with all the elements that went to make up the success of successful crop culture, worn out by mismanagement, but now set upon a practical, definite basis from a business point of view. This is simply the application of the principles inculcated in this Institute, an application of missionary work, by the missionaries who are reaching out and helping those who need help more than any other class in this country.

Of the 29,000,000 wage earners in this country, more than one-third are directly engaged in agricultural pursuits; in other words over 11,000,000 of wage earners in this country are engaged in agriculture and agricultural pursuits. That means that we have this great mass and great class of people who, as our friend Mr. Dye says, represent the very foundation of all our success and material wealth. This class of people are now beginning to be reached, as it were, by the Farmers' Institute Department; by the College Experiment Station; by the Grange, and by the work done by the Department of Agriculture of the National Government; and better and still better, I may say, that the individual in his home is becoming a teacher of principles. He is beginning to look deeper and deeper into these problems. He is beginning to unravel these intricate matters in his own home circle.

It was my pleasure recently to spend an evening with one of your most successful farmers in this State, and the whole drift of the conversation that evening was upon problems that confront the individual on his farm, and how he has successfully worked them out and succeeded. And I want to say to you that the youngsters in that family were as much interested as could possibly have been a miscellaneous outside audience, because these young men and young women in that family and by that fireside, realize as they never realized before, that the tendency of the times is back to the land; and when you get into great congested cities like Philadelphia and

New York, we find that the people in some of the sweat-shop districts are beginning to ask and want a home in the country. This is largely due to the fact that the telephone is connected with the home—has connected their business interests with the home in the country to such an extent that the busy man in Wall Street or the busy agricultural editor can live in the country and still conduct his business by keeping his finger on every detail of his business, although he may live miles away, which has been made possible through the electric trolley, a condition which ten or fifteen years ago was practically impossible, and a man can live in a little hamlet or village now at five, ten, fifteen or even thirty miles distant from his business, and still go backward and forward to his office. The tendency is back to the land, and it behooves us as interested in all these movements to build up and lift ourselves higher in the scale than we have ever been before. From what I have said, my friends, you will see that the attention of the people in the cities has been turned away from those specific lines of work in which they have been engaged, back to the country; hence I say that I believe within the next ten years we shall see a greater advance along these lines than we have ever seen before.

I want to leave one word with you and that is this: This is primarily a day of observation. There is a great difference between observation and imagination. A little story will illustrate this: While traveling in the South I came across an old colored man who was said to have been the best shot in that whole county, and the old man prided himself on the fact that he never failed when he pulled a trigger on a 'possum; he always brought him down. As the story goes, he started out one afternoon on a 'possum hunt with one Bill Jones and they came up to a very large tree in an open field and out on a limb ten or twelve feet from the ground, the old colored man saw, or imagined he saw one of the largest and fattest 'possums he had seen in all his life. Drawing up his rifle he pulled the trigger but no 'possum came down. Now Sam's friend, Jones, grew rather suspicious. He looked at the tree carefully but could not see any signs of a 'possum, and he turned around to the old colored man and said, "Sam, I tell you there is no 'possum in that tree." "O," said Sam, "my eyes never failed me. I've killed nigh onto three hundred 'possums in my day, and I'm going to try it once more." So the old gentleman loaded up again, raised his rifle, pulled the trigger again but no 'possum came down. Then his friend Jones walked around a while, looked at the tree and thought there must be something wrong with the upper part of old Sam's head, and he looked him over carefully and away out on the end of his eyebrow there was a louse, a product of his own head, a concrete example of imagination. On the other hand, in the case of Jones we have one of the best ex-

amples of observation that I could possibly state. Jones was an observing man, knowing there was no 'possum in that tree, his object was to discover what Sam had seen which he imagined to be a 'possum.

DEPUTY SECRETARY MARTIN. Old Sam represents the old farmer then.

PROF. JOHNSON: So be careful when you load your gun and be sure that your game is always in sight and don't let the other fellow deceive you.

MR. MARTIN: As I cast my eye over this audience I see over here on the left a representative, in a certain way, of Pennsylvania's favorite agricultural paper entitled, *The National Stockman and Farmer*, Mr. Alva Agee. He needs no introduction in Pennsylvania. He is well known in the farmer's family in this State. Will Mr. Agee please come forward and make some remarks.

MR. AGEE: Mr. Chairman, I do not feel that I am a stranger in this meeting. I recall the fact that ten or twelve years have passed since I first met very many of you in this room. I thought that last night as I passed in the rear of the audience and noted your appearance that I could discover that the marks of time began to show and yet after all, I see very little change. I am glad, friends, and I congratulate Pennsylvania, that we have a Director of Institutes here who stands in the front rank of institute directors for providing a meeting of this sort, in giving to us a Normal Institute that will prepare us for the work that we have to do. Only recently have I realized fully that the science of agriculture is a new thing; that within the last twenty-five years there has grown up what may be truly regarded as a science connected with the art of agriculture, and I am delighted that I am living and that we are living in that day when you and I have the privilege of helping to carry to our co-workers on the farm these new facts. The work of an institute director, the work of an institute lecturer I mean, is made better through these normal meetings; and the work of the agricultural press of to-day has greater influence than it will have at any future time in scientific agriculture because we are teaching men who can heartily appreciate it that there is a science of agriculture that is of the greatest importance to us. Why, thirty-five years ago this State had not got to work; these facts had not been developed, and now we stand in a way, if we can assume to say it, we stand in a way between the ultra-scientist, the man in his laboratory, and that one who has not the time that we are taking for the study of the results of science. It is our business to study these results and see where they apply to our field; how the man who must have a dollar in this world

for the education of his child can take hold of these new facts that the scientist works out and convert them into that dollar. And do you know, I would not exchange the opportunities that you and I have to-day in the translation of these scientific facts, into the terms of the farmer, who has not had the opportunity to study, I would not exchange the opportunities for usefulness that you have, gentlemen, and that I have to-day, for the work of any other man on the face of the earth, unless it be the work of the farmer himself. It is not a matter of popularizing agricultural education, nor is it a matter of popularizing science; I do not care for those things specially. It is for the results that we are going to get in better country life, better rural life and by helping the man who is endeavoring to-day to secure another dollar that he can expend usefully and helpfully for his children and for his family.

Now that is where we believe there is another reason to congratulate Pennsylvania, that there is a Director of Institutes here who brings together in these normal meetings working associates from the State College, from the Department of Agriculture at Washington, who meet with us and impart their knowledge so that we can think over it and study it, and weigh it and then carry it back to the men who will make the institute audiences the coming winter.

I thank you for your attention and the privilege of saying these few words to you. If I have just one criticism of our Director, it is that he should have called upon me at all and that he said that I am an outsider, because I like to think that I am a Pennsylvanian and you can't get rid of me that way. A gentleman in Ohio lost his wife a few months ago and he met a friend in Pittsburg on the street, and he said to his friend that it was hard for one to lose his wife. The Pittsburger said, "Yes, it is; it is almost impossible."

The CHAIR: We will now proceed with our regular program. The first number on the program is, "Soil Bacteria and Cultures—Their Relation to Leguminous Plants," by Prof. T. R. Robinson of the Bureau of Plant Industry, Department of Agriculture, Washington, D. C.

The paper of Prof. Robinson is as follows:

SOIL BACTERIA AND CULTURES—THEIR RELATION TO LEGUMINOUS PLANTS.

BY PROF. T. R. ROBINSON, *Bureau of Plant Industry, Department of Agriculture, Washington, D. C.*

The topic assigned me to discuss, "Soil Bacteria and Cultures," though comparatively new, has doubtless come to your attention through the press and magazine articles, numerous times within the

past year. It is a subject which offers wide opportunities for startling write-ups and rosy predictions; moreover, the whole subject of bacteria is such a hazy conception in the layman's mind that it is doubly easy to obtain an erroneous idea of the proper usefulness of soil inoculating cultures. To begin with, let it be understood that soil inoculation is not a process "to get something for nothing." It is no scheme for "perpetual motion" in crop-production; it contemplates no real revolution in agricultural methods and ideas.

The bacteria we are to consider are really but a small part of the *soil bacteria*, namely, the group which nature has adapted to infect the roots of leguminous or "pod-forming" plants, thereby forming protuberances called "nodules" or "nitrogen-knots." This latter name is derived from their well recognized ability to supply the plant with nitrogen derived from the air and it is this power which accounts for the fact that soil which bears a clover crop is actually enriched for the succeeding crop. This fact has been utilized to advantage since the earliest days of agriculture by including in the crop rotation some of the pea-like plants for adding nitrogen to the soil.

It is only in comparatively recent years, however, that the precise reason for this soil improving power of the legumes has been established. The demonstration by experiment that legumes could be made to grow normally in soils entirely lacking in nitrogen, provided the nodule-forming bacteria were present, proved beyond doubt their nitrogen-fixing power, and gave a sufficient reason for a further study of these organisms. The importance of soil nitrogen need not be urged in addressing such a body as this. As Prof. Bailey recently said: "The quest of nitrogen has enlisted not only many of the wisest men, but it has absorbed the attention of even the major part of mankind; for, by far the greater number of men have lived on the bounty of the soil and their accustomed work has been an effort to maintain that bounty."

Now the question may arise, "If these beneficial bacteria are already in the soil, why need we concern ourselves about them?" Doubtless in many cultivated soils there is no need to take them into consideration, except as we utilize them by occasionally sowing legumes. But, unfortunately, there are many soils which are not naturally stocked with these bacteria. The attempt to grow legumes in such soils results in one of three things:

- (1) The crop sown either fails absolutely, or it
- (2) Makes a scanty growth the first year and only after repeated sowings becomes established, or it
- (3) Grows (in fairly rich soil) without the aid of the bacteria (that is, having no nodules) drawing its nitrogen entirely from the

soil and thus its benefit to the soil is no greater than a cereal or other non-leguminous crop used as a green manure.

No doubt you are all familiar with the second phase; the final establishment of such a crop as clover, alfalfa, or soy beans only after repeated sowing on the same soil. This is due in part to the bacteria carried into the soil with seed and chaff, and in part, no doubt, to the gradual adaptation of other bacteria previously associated with some native plant of the pea or clover family. If the figures could be gathered representing the annual loss of seed and labor involved in attempting to establish legumes on soils new to the plants, the aggregate, I am sure, would convince the most skeptical of the economy and, in many cases, the absolute necessity of introducing the bacteria by some form of artificial inoculation. The method which most readily suggests itself is the transfer of soil from an old field. This method, while it has often given most satisfactory results, is still open to objection. The use of soil of unknown origin for this purpose is liable to carry into new localities plant diseases the damage from which would be greater than any possible benefits obtained from the soil inoculation. Among the diseases which might readily be carried in this way are the bacterial diseases of the potato, tomato and egg plant, the wilt disease of cowpeas, melons and cotton, and various root-rot and nematoid diseases widely distributed in the South. No careful fruit grower would dare use soil in his orchards without first ascertaining that it had been taken from a locality free from root-rot and crown gall diseases.

The liability of spreading weed seeds and insect pests is of scarcely less importance, so that in every case, soil used for this purpose should come from a source which is definitely known and is safe to use. This is a difficult matter to determine in many cases, so that, under average conditions, the method of soil transfer is open to suspicion if not positive objection.

To obviate such difficulties as these the attempt was made to cultivate the bacteria in pure cultures and thus introduce them into the soil. You are doubtless familiar with the failure of early attempts along this line—the German product “Nitragin” proved unsuccessful in practice, owing, as was afterward demonstrated, to faulty methods of cultivation and distribution. The rich nitrogenous medium used gave a luxuriant growth of the bacteria but the conditions of life were so easy that the organisms deteriorated in vigor and failed in their essential part as “nitrogen-fixers” when again released in the soil.

When the problem was taken up in the Laboratory of Plant Physiology, at Washington, a different principle was adopted; the bacteria were given a food supply practically devoid of nitrogen and only those organisms which were vigorous and able to utilize nitro-

gen direct from the air could survive such conditions. In this way a strain of bacteria was developed which was, so to speak, "nitrogen-hungry," and when again released in the soil they showed the result of this forced activity in using atmospheric nitrogen. This result was not arrived at in a single test nor even in a single season. Continuous work was done in laboratory, greenhouses and at the Government Experimental Farm at Arlington for three years. In one season, something over 10,000 separate inoculation experiments were conducted on small plots at the Experimental Farm, and the practical side of the question was continually kept in view.

It was not considered sufficient that the bacteria should merely be grown without deterioration: the constant aim was to increase by artificial methods of cultivation their usefulness as "nitrogen-fixers" and to adapt the cultures to actual use under field conditions. You are all familiar with the marvels which horticulturists have produced by scientific plant-breeding and selection. Who can say that *similar* results, at least, are not possible in dealing with microscopic plants—for instance, the nodule bacteria of legumes? As a matter of fact, the methods of growth previously outlined have been shown by actual tests in the laboratory to produce bacteria of higher efficiency in gathering nitrogen than the forms grown without regard to the laws of plant breeding and selection, and their effect when introduced in the soil has in many cases verified the belief that these highly-bred forms are actually given an advantage over the wild forms existing in many soils.

It was not only necessary to properly grow the bacteria but they must be distributed in a form which the farmer could handle for himself. Hence, resulted the "dry culture." By growing the bacteria first in a liquid culture, soaking this up with absorbent cotton and drying the cotton, it was found that bits of this dried cotton would serve as "starters" for new cultures. The bacteria on the cotton had only to be immersed in water and supplied with a few simple nutrient salts in the solution to resume their interrupted growth and thus soon fill the water with active bacteria. By sprinkling this liquid culture upon the seeds to be sown, the bacteria may be carried into the soil and assist the plants in securing their nitrogen supply; or, if the liquid be mixed with clean soil and this inoculated soil spread over the prepared ground previous to seeding the same result would be obtained. This method seemed sufficiently simple to be handled by any person of average intelligence, and accordingly plans were perfected by the spring of 1904 to test the method on a large scale. During last spring, summer and fall about 12,500 packages were sent out, reaching farmers in nearly every state and territory and supplying cultures for tests with all the common legumes. The whole success or failure of the method, of course, depended upon

what could be accomplished *by the farmer, on the farm, or the gardener, in his garden*, with no assistance other than printed directions, and *usually* without comprehending, except in a very vague way, the reasons for the various operations necessary. If the tests had been carried on by carefully selecting the experimenters, supplying the cultures only to trained bacteriologists, botanists, and men of similar professions, the results might have been in some ways more uniform. This course would not, however, have solved the practical problem, namely, the adaptability of the culture method to general use; therefore, no discrimination of any sort was practiced, all applicants for cultures being treated alike. The results obtained have already been made public in two bulletins issued by the Department of Agriculture (Bulletin No. 71 of the Bureau of Plant Industry, and Farmers' Bulletin No. 214) and show that, under the proper conditions, the use of cultures is decidedly profitable and that the dry culture method is eminently practicable under average farm conditions. Very recently a supplementary bulletin has been issued (Part IV of Bulletin No. 72, Bureau of Plant Industry) giving in condensed form specific information as to where the use of cultures may be profitable, and where they are of no benefit; also furnishing directions for making up large amounts of culture material for field use from the pure culture "starter."

Eighty per cent. of the reports which were of such a character that a direct comparison could be made showed a gain from inoculation, and reports are constantly coming in which at least maintain this average. Of course, there were many failures from definitely stated causes such as drought, flood, poor seed, weeds, improper cultivation, etc., which are not reckoned in the percentage given and it must be recognized that *there is no "magic" in the cultures* to overcome failures resulting from such causes. Neither do the bacteria supply all the conditions for growth; they are active only in storing up nitrogen, and where soil is so deficient in potash and phosphorus as to require these elements inoculation will *not* act as a substitute. The need for lime upon acid soils is another factor of great importance. The legumes generally prefer a soil rich in lime and a partial explanation for this lies in the fact that the bacteria can not properly perform their work in an acid soil; they either fail to produce nodules, or the nitrogen fixation is greatly reduced.

The question now arises, "What *are* the proper conditions" under which it may be advantageous to inoculate seed or soil?

This will depend largely upon previous experience in growing legumes on the same soil. If no difficulty has been experienced in getting a stand, and the crop has been up to the average it is usually safe to assume that the soil is already adequately supplied with

the bacteria and requires no inoculation. In the future it will be well, however, by examination of the roots to make sure of the presence of nodules on all legumes grown. Without the nodules the legumes will deplete the soil like any other crop, and with the nodules the growth is almost always more satisfactory and economical. In soil already rich in nitrogen, inoculation will not often pay, as the plants will draw from this direct source instead of from the air; moreover, the presence of considerable nitrogenous material in the soil acts as a check upon the bacteria in their normal function of forming nodules and fixing nitrogen. Their apparent refusal to add further amounts of nitrogen to a soil already rich may be regarded as a kind of poetic justice; so that in this case, at least, the scriptural rule, "To him that hath shall be given," does not seem to apply.

It is, therefore, pre-eminently for *poor soils* (low in organic matter that is, nitrogen) that inoculation offers the greatest possibilities—the type of soil, in fact, which is most benefited by leguminous green manures. The fact that legumes do not thrive is not in itself an indication that the bacteria are lacking, there are, of course, other soil conditions to be considered. An examination of the roots as to the presence or absence of nodules is the first and simplest criterion, but, lacking this information, nothing short of an experiment in inoculation will disprove the assumption that the lack of bacteria is responsible for failure. Moreover, the finding of a few nodules and these only on scattered plants, indicates that the soil is inadequately supplied with bacteria and their wider diffusion by means of cultures is often of distinct advantage.

Finally, if the cultures used contain organisms of the highest type, some advantages will often be found from inoculation even in soils where legumes have previously made a fair growth, but not satisfactory in all respects.

Perhaps the most important application of cultures is in connection with sowing legumes, such as alfalfa, in regions where they are entirely new. The bacteria adapted to infect the ordinary cultivated clovers and which are quite widely distributed do not produce nodules on alfalfa, nor do the organisms of our common peas and beans readily take to the soy bean and cowpea. In sowing alfalfa, for instance, in new soil inoculation where other conditions are favorable, will usually make the difference between success and absolute failure, a difference not to be reckoned in percentages.

To illustrate the points which I have attempted to present in the foregoing discussion, it may be well to cite a few concrete examples such as are afforded by the reports received from farmers who were furnished with cultures for experimenting. These reports fall under

several classes according to the conditions under which the experiments were carried on. The first class includes those cases where the effect of inoculation was brought out in a striking manner owing to the entire absence of the bacteria in the soil previous to using cultures. A few reports only can be cited and in most cases those selected have been recently received, thus furnishing evidence not only as to the stand secured but also as to the ability of the plants inoculated to go through the winter. The importance of selecting reports of this kind may be seen from the following, from South Haven, Michigan:

"Last year I tried a culture of nitrogen-fixing organisms for alfalfa. I reported failure, but this year the difference between the inoculated and uninoculated plots can be plainly seen. The plants inoculated are at least twice as large and much darker in color. I received the inoculation outfit when the plants were about two inches high and sprinkled a small plot in the field with the culture solution. On account of weeds we had to clip real often last year and so we could not see the difference."

Also a report from Allentown, New Jersey:

"Good growth last fall, went through the winter fine, coming on fast now. Planted alfalfa on same ground before without treating seed and it proved a failure, but this is a great success."

From New London, Ohio:

"Plot sown without inoculation came up good, but did not winter. Plot inoculated wintered and will harvest a fine crop of hay. Sown on clay loam tiled."

From Gretna, Louisiana:

"Of the 100 pounds of seed about two-thirds was inoculated (it being all the bacteria would admit of), and this amount was planted to six acres on December 1 and 2. The remainder of seed not inoculated was seeded to remaining four of ten-acre plot. That inoculated grew thick and at this date (April 28, 1905,) is 19 to 24 inches high, balance thin and not more than from 6 to 10 inches."

From Doe Run, Pennsylvania:

"My alfalfa has a very fine set at present. This is my third attempt, but the first inoculation. The other two were failures. The tops are already (May 1, 1905,) eight inches high and roots twelve inches deep." (Sown last August.)

From Woodbine, Pennsylvania:

"Result of inoculation very gratifying. At this date (May 3, 1905,) the plants average fully ten inches in height and stand very thick and of good color. The plants from inoculated seed are fully seventy-five per cent. larger than from untreated seed."

From Decatur, Georgia:

"I desire to say that I have had very interesting results here in Georgia with a test of inoculating material on alfalfa. My strip of uninoculated alfalfa that had a good supply of both lime and phosphoric acid is now very yellow and will almost certainly die. All strips of inoculated alfalfa are dark green, but the strip supplied with lime and phosphoric acid has made the best growth."

It is now (April 9, 1905,) two feet and six inches high, and will do to cut May 1."

(Specimens received April 22 showed splendid nodules on inoculated plants; none on others; gain by weight 400 per cent.)

From Mount Vernon, New York:

"Last July I planted 38 pounds good seed after treating as directed. Part of the ground I tried alfalfa on before without inoculating, which grew a little, then faded away to nothing, but this seeding grew from the start and had a nice top when snow covered it last December. This spring it has started up fine and is growing rapidly, and is bound to be a success, all owing to the seed being inoculated, I firmly believe. A neighbor just over the fence in an adjoining field sowed two acres at same time I did, without inoculation, and his is a total failure."

From Sidney, Ohio:

"Perceptible nodules were formed on the red clover plants; both root and top development was much greater than that produced from non-inoculated seed and the latter produced no nodules. Soil a worn-out clay."

Similar results might be cited for other legumes, such as cowpeas, soy beans, garden peas and beans, but as these crops were harvested last season the reports were sent in last fall and many of them have already appeared in print. Two cases, however, may be given as illustrating the result of growing properly inoculated legumes to enrich the soil for succeeding crops. Last fall a report came in from Cresson, Pennsylvania:

"On the ground which never before would raise a crop of beans, we had a marvelous crop this year, the heaviest ever seen in this locality. Planted seven rows in middle of field without inoculating, and the old conditions prevailed."

Just one week ago, the same grower reported that rye sown in the fall was showing the effect of the bean crop in a remarkable manner. He says:

"In regard to the strip where the beans were grown without inoculating, there is a marked difference, not so much in the height of the rye as in the color and thickness of the growth. The color on this strip being a light or yellowish green, with a light stand on the ground, while the part where the beans were inoculated, the growth is dense, fully fifty per cent. more rye growing on the ground and the color being of the darkest green. The inoculated strip is very noticeable to the eye, the outlines being sharply defined. The difference in height is about 5 or 6 inches."

A personal visit to this place, fully confirmed the owner's observations.

From Macon, Georgia:

"You sent me some soy bean cultures last summer which I never reported on. The crop was nearly half ruined by the awful drought we had, but the point I wish to call your attention to is that I planted the whole field where these beans were in fall oats. The crop where the beans were planted are at least one-third higher than the others and much fuller headed and tillered out much more, and are so green that they are almost black."

Now, taking another class of reports, those showing the effect of inoculation in soils where the same legume is commonly grown and fairly satisfactory. From Los Angeles, California:

"The 40 acres (in the Imperial country) which I had planted with alfalfa seed inoculated according to your directions has a fine stand of alfalfa 4 to 8 inches high in 10 weeks, and winter at that (February 6, 1905). It is almost a perfect stand. On 25 acres right along side of this I only got about three-fourths of a stand, and it was planted at the same time in the fall."

From Fort Worth, Texas:

"Sowed 1,000 pounds of seed on 50 acres. Obtained one-third more alfalfa hay where inoculated; three-fourths ton per acre first cutting, one ton each from the other two cuttings."

In clover regions, too, results fully as striking have come to our attention. From Lenox, Massachusetts:

"A year ago you very kindly sent me a package of inoculating material for red clover. I followed directions and planted the seed upon a plot of land on my farm in Lenox, Mass., that had not been fertilized during 16 years. A litmus test showed acidity which was corrected with 'lime ashes.' Upon adjoining field also limed, but sown with untreated red clover, I obtained a very poor showing, while upon the field sown with red clover inoculated with your bacteria I got a splendid growth."

From Mortimer, Kentucky:

"Last spring you sent us enough bacteria to inoculate about a bushel of clover seed, and we have gotten fine results from it; the only clover that lived out of 75 acres."

From Hopkinsville, Kentucky:

"I cut two acres of clover which had been inoculated and two which had not been, and find that there is a difference of about 500 pounds per acre in favor of inoculated seed."

From Flat Ridge, Virginia:

"The clover is two or three times larger than portion of field not treated. You can tell where inoculated as far as you can see the field."

I might add that I personally inspected this particular clover field and found the report literally true. A distinct line, visible a half-mile off, marked where the inoculated seed had been used, although it was sown on the upper parts of the field, more exposed to the effects of washing and drought. The region is one where clover is regularly used in rotation though it has not always yielded satisfactorily.

One report from a typical cowpea region in Georgia indicates a parallel advantage from inoculation:

"The growth has been rank, of rich dark color over the entire field that was seeded. A difference in favor of the inoculated pea was quite noticeable. My neighbors and friends who have seen the field insist that the field is seeded with a different kind of pea. I wish to express to you my satisfaction and gratification with the experiment. I believe the work you are doing is of inesti-

mable value to the farmers of our country in the future redemption and improvement of our lands."

This plantation was also visited by me at the time of harvest and the inoculated piece of 10 acres yielded one-half ton per acre more peavine hay than 40 acres sown without treatment—this, notwithstanding the fact that the 10 acre piece was seeded two weeks later and was regarded by the owner as a poorer piece of ground. Nodules were present on both fields, showing no striking lack of the bacteria in the soil.

A few cases of special interest may be referred to in passing:

For instance, the effect of inoculation on a growing crop; of course, the usual application is preliminary to seeding. From East Bend, North Carolina, a recent report shows what may be done in this way:

"Last summer you sent me two packets of alfalfa bacteria which I carefully applied according to directions. With one packet I top dressed a lot which had been mown three times. The crop was light and looked yellow. I harrowed in the inoculated soil and soon noticed that the growing crop had turned to a healthy green and our next mow was the heaviest we had. I am much impressed with its value."

The duration of the effect of inoculation is also a matter of some importance. It is generally conceded that the bacteria will live over in the soil from season to season, unless too long a time elapses between sowing the same legume, that is, within three to six years. This is illustrated in the following report from Gillham, Arkansas:

"Two years ago I received a package of inoculating material from you for alfalfa, and a year ago I reported my alfalfa a failure because of weeds, although the inoculation took. I plowed up the ground and planted it in Kaffir corn and raised a better crop than I expected. This year or spring I sowed it again to alfalfa and the nodules cover the roots of this new sowing. It was two years ago that I inoculated the ground by mixing the culture with soil and harrowing in it. I used about two buckets of bacteria inoculated soil to the acre and sowed it broadcast."

Somewhat similar results are reported from Knoxville, Tennessee:

"In the fall of 1903, you were kind enough to send me enough of bacteria culture to inoculate one acre for alfalfa. I applied it on one acre after manuring the land with stable manure, and sowed the alfalfa. At the same time I inoculated twelve acres with soil obtained from an old alfalfa field. This twelve acres was also treated with stable manure before inoculation and before seeding."

The alfalfa came up beautifully but during the very cold open winter which followed, both fields froze out.

"I plowed up the twelve acres in the spring and again inoculated it with soil and manured it. Again, I obtained a perfect stand on the twelve acres, but the alfalfa plants did not seem to grow any after the last cutting and it froze out in patches, though some of it is excellent.

"Now for the one-acre field. In August last I plowed it and sowed it in alfalfa, without re-inoculating it. It came up at once and was 8 to 10 inches

high when the winter closed in. This piece *did not* freeze out, but started early in the spring and has grown riotously ever since. We have been cutting it for two weeks and feeding it green to thirty-five dairy cows, and have not yet cut half of it. The new growth started at once and will be ready to cut again by the time we need it.

"The purpose of this report is to call your attention to what seemed to me to be a fact, viz: That the bacteria in the cultures are more active and more alive than in the inoculating soil. This may be due to loss in drying and transporting the soil, which was brought about 500 miles by rail."

The testimony here presented in regard to the use of soil in comparison with cultures receives some support from an account recently received from Illinois:

"Last year you sent me for my farm in Cook county, Ill., some inoculating material for alfalfa. I also received some inoculated soil from the University of Illinois. I planted about four acres. (We sowed broadcast.) Plot No. 1. One acre was inoculated with soil, thereupon plowed, etc., etc. Plot No. 2. Two acres were inoculated with soil and thereupon disced and harrowed, etc., etc. Plot No. 3. One acre was treated with your material and thereupon harrowed lightly, etc. Plot No. 3 shows wonderfully fine this spring. Plot No. 1 shows next best (very fine), and Plot No. 2 shows also very good, although not as fine as the other two."

In garden use the inoculation of peas and beans, by insuring an adequate nitrogen supply, seems in some cases to hasten maturity, a matter of importance to many growers. From Janesville, Wisconsin:

"Plants were stronger, blossomed two weeks earlier, stood dry weather better, and matured more peas than plants not so treated. In addition, I inoculated seed for four other parties, requesting them to report to me. One man reports 50 per cent. better yield. His soil was poor, and the bacteria showed more effectively by contrast. A market gardener reports a larger yield than from similar seed not treated, but to him the best feature was earlier maturity by two weeks. All report favorably, those planting on poor soil reporting the largest increase."

The use of seed already inoculated will no doubt save much time and trouble when persons are sowing small quantities of seed. All leguminous forage seed, sent out by the Department of Agriculture is previously inoculated, and the effect is evident, in many cases. In a recent bulletin from the Maine Station mention is made of sowing some treated alfalfa seed:

"The seed was specially procured from the United States Department of Agriculture, and had been inoculated with alfalfa bacteria. Root tubercles have developed abundantly on all the plots."

A representative of the Department who visited these plots further demonstrated the fact that alfalfa sown in the vicinity without inoculation was barren of nodules and failing. It will probably not be long before "inoculated seed" will be a regular item of trade and, with proper precautions, there is no reason why seed so treated

should not give a good inoculation, that is, if used within two or three months after treatment.

In regard to the proper method of handling soil-inoculating cultures very little need be said; the directions are quite simple. The dried cotton culture is usually wrapped in tinfoil and, after opening, is placed in a solution formed by adding the contents of package "No 1" to a definite quantity of clean water. This solution contains one per cent. of sugar 1-10 per cent. of potassium phosphate, and 1-100 per cent. of magnesium sulphate. These salts with the sugar as a source of energy, favor the growth of the nitrogen-fixing bacteria held dormant in the cotton but do not offer a good medium for the growth of yeasts and molds carried about in the air and which are bound to contaminate the culture in a greater or less degree. This contamination should be reduced as much as possible by previously boiling the water and allowing it to cool, at least until lukewarm scalding out the bucket or tub, and keeping the liquid covered at all times. The temperature maintained should be that of an ordinary living room; about 70 degrees Fahrenheit. After twenty-four hours' growth in this solution, another package is added, containing ammonium phosphate in amount equal to one-half per cent. of the total solution. This causes a rapid division or growth of the bacteria so that during the next twenty-four hours, with all conditions favorable, the liquid will become so filled with the organisms that it will appear slightly milky or cloudy. It is then ready to apply to seed or to be mixed with soil, either method being effective for carrying the bacteria into the soil. One gallon will moisten at least two bushels of seed which should then be spread out to dry but not so as to receive the direct sunlight; if mixed with soil for top dressing the same amount, one gallon, will impregnate sufficient soil to spread over four acres (or less). By hand-sowing, a wagon load will be sufficient for this area.

The successful issue of last season's experiments brought about a demand for the cultures which the Department of Agriculture could not have anticipated, nor is it probable that our laboratories could have met the demand in any case. Early in February we found that we had already listed as many applicants as we could accommodate up to July 1st and since that time we have been unable to furnish cultures except in cases where, for special reasons, a test appeared necessary. This fall and next spring, however, the distribution will be continued as far as our limited facilities permit, but our lists will not be made up more than two months previous to seeding time.

Naturally we have had a great many inquiries in regard to the quality of the cultures obtainable from commercial sources. We can only say that the bacteriologists for such concerns have been given

all the information necessary and that there is no reason in the nature of the process why they should not ultimately produce as effective cultures as those sent out by the Department. As far as our examinations have gone of any cultures prepared according to the Department dry-culture method, we have had no reason to believe that this culture work is not being properly done. The patent which the Department holds on the method of growing and distributing the bacteria prevents anyone from obtaining a monopoly and it is likely that by another season there will be a considerable addition to the list of firms offering these cultures for sale. By competition, therefore, the cost to the farmer or gardener will undoubtedly be much lessened and the wisdom of the Department's course in patenting the method is already demonstrated. Thus the benefits of the discovery will be brought within the reach of all, whose soil conditions call for artificial inoculation.

Before investing extensively, however, in any new method for increasing crop yields, whether bacterial or of a different nature each man should determine by small experiments its value for his peculiar needs, and not be unduly influenced by results obtained perhaps under widely differing conditions.

The CHAIR: No. 2 on the program will now be taken up. "The Proper Theory of Farm Fertilization," by Prof. Wells W. Cooke, Washington, D. C.

Prof. Cooke's paper is as follows:

THE PROPER THEORY OF FARM FERTILIZATION.

BY PROF. WELLS W. COOKE, *Washington, D. C.*

The answer to the question of the proper theory of farm fertilization has been given in various ways by different speakers and writers. The one to be given here is based on the idea that no theory of farm fertilization is correct unless its teaching can be followed year after year and generation after generation, and the soil still remain in excellent condition for the production of large crops. But before proceeding to the enunciation of this theory, it will be well to consider some of the theories that have been popular and are still heard from the lecture platform. Most of these theories are based on the idea that we should aim to find out what plant food is in the soil, what elements are most lacking, and then supply this deficiency. All agricultural soils contain large quantities of plant food. A fair average for a good soil in the upper foot per acre is about 8,000

pounds of potash, 4,000 pounds of phosphoric acid and 5,000 pounds of nitrogen. As compared with the amount of each of these elements required by a single crop in one year, these quantities are enormous.

Some of the common farm crops extract from the land the following amounts of plant food per year:

	Nitrogen.	Phosphoric acid.	Potash.
	lbs.	lbs.	lbs.
Wheat, 30 bushels and the straw,	48	21	29
Oats, 60 bushels and the straw,	73	26	62
Clover, 2 tons,	102	25	83
Potatoes, 200 bushels,	50	27	70

Each acre, therefore, has enough of the elements of plant food for many generations of crops. But fields differ and while one may be richer in one of the elements than the figures given above, it may be quite lacking in some other element.

One of the earlier theories of farm fertilization was based on the idea, that by chemical analysis, what the soil was most lacking could be learned, and then this lack supplied. When the agricultural colleges were founded more than forty years ago, one of the principal aids they were expected to bring to the farmer was along this line. The farmer was to send a sample of his soil to the college, the chemist would analyze it and then send back word just what fertilizers to apply. But when the colleges were started, the agricultural constituency was surprised to learn that chemical analysis could not help them. The chemist could of course analyze the soil, but in their poorest soils where they could not grow profitable crops, he would find enormous quantities of plant food. The trouble was that the chemist used strong acids and learned the total amount of plant food present, but he could not tell whether or not it was available for the plant, and where he found ten thousand pounds of food there may not have been ten pounds in such condition that the plant could use them, therefore, his analysis was of no agricultural value. Of late years the attempt has been made to devise some method of analysis that would show the amount of available plant food in a soil. So far success has not been attained and if the later ideas of this paper are correct, then the solution of this problem would be of scant use to agriculture.

When the agricultural colleges realized that chemical analysis would not aid the farmer in his search for the proper fertilization of his farm, they evolved a new scheme. They said, "Ask the land

and the crop what is needed," and they advocated what are called fertilizer plot experiments. The plot of land selected was divided into several long narrow strips, one was fertilized with a complete manure containing nitrogen, phosphoric acid and potash; a second with the same omitting the nitrogen; a third omitting the phosphoric acid and a fourth omitting the potash. If the removal of any one of the elements caused a decrease in the crop, it showed that the soil was deficient in that element. Many combinations have been tried in addition to those mentioned above and many hundreds of these tests have been carried out in various parts of the United States. Their value to agriculture has been almost nothing and for these reasons. If the tests are successful the most they can tell you is a year later than the information is needed, for the results indicate what the field needed at the beginning of last season, but not what it will need next season, after the present year's crop has drawn its supplies of plant food from the soil. It may indicate what is needed for the special crop grown but it does not show what may or may not be needed by a crop of another kind on the same soil; nor does it offer any solution to the problem of what is needed in another county, on another farm or even on another field of the same farm.

Nearer a correct theory of farm fertilization were those who have advocated the doctrine: "Add to the soil what you expect the crop to take from the soil." But even this theory does not go quite far enough. The fundamental objection to all the earlier theories is that they were seeking some way by which the addition of a partial fertilizer would produce a full crop. In other words, they sought to add only part of the plant food needed and expected the crop to obtain the remainder from the store of plant food already in the soil. Such theories are not correct, for they violate the rule laid down at the opening of this article. If such a scheme of fertilization was carried on for a long term of years, it would eventually impoverish the ground.

The correct doctrine is that one which instead of striving to see how much of the needed fertilizer can be secured from the supplies already in the soil, looks on all the plant food in the soil as so much working capital, to be used as needed, but never to be reduced and to be augmented continually for the production of better and larger crops.

The last theory mentioned is not quite correct, because all plants need at their command a good deal more plant food than is to be removed in the crop. Thus in the case of clover, a crop of two tons to the acre removes about 80 pounds of potash per acre. Nevertheless the crop at the beginning of the season must have at its disposal much more than this 80 pounds of potash, for the roots

and the stubble of the clover contain about the same amount of plant food as the top, so that the plant actually takes from the soil twice 80 pounds or 160 pounds of potash. But this is not all. The clover root will not fill all of the soil, but if the plant is to do its best, if it is to raise the largest crop possible, every inch of the soil must be full of plant food, that wherever the clover roots go in search of food they can find a bountiful supply all the time. How much of this surplus supply is needed for the best growth of the plant cannot yet be stated with exactness, but it is known that it must be at least twice as much as the plant is to use. Therefore, if one expects to raise two tons of clover per acre from a given field, he must be sure that each acre contains at least 320 pounds of available potash.

The proper theory of the fertilization of the crop, therefore, is the addition of so liberal an amount of plant food as to make it certain that the land contains more fertility than the crop will need. This should be continued year after year that the farm may be continually growing richer.

The opposite plan has been far too often used in this State. Everywhere may be found farms whose owners have endeavored year after year to get as much as possible from the land and return as little. I do not believe a man can be a good Christian, and I know he is not a good citizen, who handles his farm in such a way that it becomes poorer year by year. Each should remember that he is not the owner of the land, but its steward. Other generations and other farmers are to follow him and the land will be used as a source of human food long after he has departed. If he allows the farm to run down, he is entailing an extra amount of labor and expense on his successor, for it requires much more work and cost to bring up an impoverished farm, than to continue a good farm in its present state of excellence.

In addition, however, to the duty one owes to his posterity and to mankind, no farmer can afford to let the fertility in his land run down, even from the standpoint of present gains. The average crop does nothing more than pay expenses. It is only the large crop that pays a profit and everyone knows that this large crop can be raised on nothing but good ground well supplied with plant food. As with animals, so with plants; if the crop is to do its best it must have at its command all the time all the food it can use. In other words the soil must be so full of plant food that no matter which direction the roots grow they will find an abundance of food.

This, then, in short, is the proper theory of crop fertilization. Be sure that the crop has at the outset all the plant food it can use and add each year more fertility than the crop has removed. But some one may object: "Will not this be wasteful?" If so much

plant food is present in the soil, will not some of it be lost before the crops have a chance to use it?" Herein lies one of Nature's most wonderful contrivances for aiding the farmer. Nature has given soil a certain holding power, so that very large amounts of phosphoric acid and potash may be added to a soil and yet none of this will be carried off in the drainage water; it will be held strongly by the soil. And yet as soon as the root of a plant comes through this soil seeking for food, the soil loosens its hold and allows the plant the nourishment it desires. This beneficent result is brought about by the fact that the plant does its feeding at the end of its roots and that the point of each root is continuously secreting a small quantity of acid and this acid dissolves and makes available the plant food held so strongly by the soil that rain water could not loosen it. It is possible, therefore, for the farmer to put on at one application enough of phosphoric acid and potash for a generation of crops and have no fear of its being carried out of the soil except as the crops make use of it. All the loss there is by the extra fertilization is the interest on the cost of the fertilizer.

If the same could be said of the nitrogen, then the whole problem of farm fertilization would be much simplified. But, unfortunately, soil has not this holding power for nitrogen and still more unfortunately, nitrogen is the most expensive element of plant food. The most difficult problem of farm fertilization is the economical handling of the nitrogen supply. Nitrogen exists in several forms and combinations. It exists pure in the form of a gas and in this form is of no value to most of our crops; it exists in combination as the nitrogen of organic matter in such substances as bone meal, cottonseed meal, dried blood and the solid portions of barnyard manure; and finally it exists as the nitrogen of ammonia and as the nitrogen of nitric acid or nitrates. In only one of these forms can nitrogen be safely applied in large quantities and that is in the insoluble form of organic nitrogen. So long as the nitrogen remains in this solid form, so long it will not wash out of the soil and be lost. On the other hand, just so long as it remains in this form, it can be of no use to the crop, for all crops take up their food in the liquid form, and this solid organic nitrogen must decay, it must be broken down by the action of the various germs in the soil and changed to nitric acid or nitrates before it can become available to the crop. Then as soon as it has been converted to this available form, if there are no plant roots to absorb it, there is danger that it will be washed out of the soil by the next rain-storm.

The economical use of nitrogen demands that it be applied in more than one form. If an immediate effect is desired, the nitrogen should be employed in the forms of nitrate of soda or sulphate of ammonia that are available as soon as a shower washes them to the roots

of the plants. A little slower action is obtained by using dried blood or cotton-seed meal or any form of animal matter that decays quickly and easily. When, however, it is desired to make a heavy application that shall last through the whole of a rotation, there is probably nothing better that can be used than stable manure. Part of the nitrogen in ordinary barnyard manure exists in the soluble form and is immediately available to the crop of the first year. Another portion decays easily and is used by the crop of the following year, while a third part is more slowly attacked by the germs of the soil and furnishes nitrogen to several successive crops.

The theory of plant fertilization here advocated may be summed up as follows: Add a liberal supply of phosphoric acid and potash to the soil so as to make it certain that the crops have all they can possibly use of the elements. Add nitrogen in such forms and quantities as to furnish at all times a liberal supply and yet no considerable surplus. Add each year to each field more plant food than the crop has removed. Under these conditions you know that you will raise each year the largest crop possible under your given conditions; that the farm will be growing continually better under your hand, and that when you are called to resign your stewardship you will have the commendation of your own conscience—"Well done, good and faithful servant."

The CHAIR: The next number on the program will now be taken up. "The Cultivation of Mushrooms," by Thomas Sharpless, of West Chester, Pa.

The address of Mr. Sharpless is as follows:

THE CULTIVATION OF MUSHROOMS.

BY THOMAS SHARPLESS, *West Chester, Pa.*

Mr. Chairman, Ladies and Gentlemen: I do not know who is responsible for putting me on the program to talk to you about the cultivation of mushrooms. What knowledge I have gathered is from other people and some little experience I have had myself. The cultivation of mushrooms is not strictly agriculture but it is an adjunct, helping out the sometimes meagre profit of the dairying business of this section of the country. It is a business in which there is a great deal of labor, and no person wishes to undertake it at all unless he is able to command that labor. As an addition to farming or the dairy where a man is compelled from necessity to keep a very considerable amount of labor about him, he can work in some mush-

rooms to advantage, but nobody wants to go into it with the idea that it is a soft snap and there is nothing to do.

Now, I hardly know where to begin in the matter; but I drafted a few notes and I presume that the beginning would be, probably, the preparation of the manure for the bed. The scientific people, of which I am not one, tell us that the mushroom is composed mainly of nitrogen, so we buy manures that are rich in nitrogen, horse-stable manure being our best source of nitrogen supply for the manufacture of the material to make the beds of. This manure must not be burned; it must be made into a compost, and the nitrogen that is contained therein, which is very volatile, must be saved. Unless your manure is made into a thorough compost, you are not going to get any mushrooms, and to accomplish this, and you all are familiar with the fact, horse-stable manure thrown into a pile in two or three days will heat and turn white and then your nitrogen is gone out of it and it is good for nothing to raise mushrooms, so when you get your mushroom manures delivered on your ground, the first thing you must do is to wet it. You will never get a compost until it has been thoroughly wet. Then you must turn it every day or every two days, or it will heat very hot, up to 140 or 160 degrees, and if it does, you will lose your nitrogen out of it, and as I said before it will be good for nothing to raise mushrooms. So you must turn it every two or three days until it is done heating. When the temperature begins to fall, when it has gone down to, probably 100, or somewhere in that neighborhood, then you may safely let it lie until you are ready to make your beds; then it must be thoroughly composted, because your mushrooms won't grow except in a thorough compost rich in nitrogen.

Now having prepared your manure you put it in your bed. I shall probably have to explain a little about the building of the houses, but I will do that later on. When you put it into your bed, put it into beds approximately a foot deep. It should be tramped or rammed down pretty solid, quite solid in fact. But there is one point I omitted. When the manure is first hauled, I usually put soil or loam on it. The books say one-third loam or one-third soil. Our friend who first spoke said that soil was a great conservator of nitrogen, and the earth, as we can understand, is put in there to help hold and retain the nitrogen which you wish to transfer into mushrooms. Then after you have put it into beds, practically about a foot deep, some say that ten inches is enough, but I guess a foot is rather better, it will probably heat up again. It will probably go to 125 or 130 degrees. If it shows signs of burning, it is because you have put it in before it has thoroughly done heating. If it begins to burn, you must wet and cool it down. When it has shrunk to 100 degrees or, probably better still, to 90, you may put your spawn in there.

The spawn is buried under the surface of the manure, probably an inch to an inch and a half. A mushroom is a thing that grows on top of the ground. The spawn runs on top of the ground; then it is "cased over" as we call it; that is, it is covered with about an inch of fine loam. Now there is one very important thing to be taken into consideration and that is, Nature does everything right. The mushroom grows well in a native state in our fields; however, a long protracted dry spell is often followed by heavy rain and hot sun. Now if you put your manure into your beds too wet, I have had a little experience in that line myself, you don't get any mushrooms. The manure should be a little dry rather than too wet. If you take up a handful of manure into your hand and you squeeze the water out of it, you had better pile it up and let it dry. If it will just simply retain its shape, it is pretty nearly in the right condition.

Now as to spawning your beds. I have constructed racks made out of plastering lath four feet square, nailed across eight inches making a square of eight inches. I find that is preferable to any other plan of regulating and putting in the spawn, because it distributes it evenly all over the beds. Then we dig a hole in every open place and cover it up with manure. It should be covered about an inch deep with manure. After it has been spawned, you want to cover it with an inch to an inch and a half of soil; then you want to wait forty days anyhow before you can tell whether you have done anything at all or not. Possibly at the end of forty days you will begin to see little white specks come up all over your beds. Sometimes it don't come in forty days. One man told me a few days ago that he waited fourteen weeks before he ever saw a sign of a mushroom. Sometimes it never comes at all owing to the manure not being in the right condition or the plot not having been kept in the right temperature, either too warm or too cold. It is a pretty delicate matter to have every condition just exactly right.

There are three kinds of spawn available upon the market: There is the imported English spawn, the American spawn, and there is what is known as the Missouri spawn. These last two are grown in this country. The English spawn is the one that is used more where I live than anything else. I never tried the Missouri. I have tried a little of the American spawn, and I got an exceedingly good crop of very fine mushrooms. Three successive crops grew on the bed and then I quit. I find that the English spawn keeps up a succession of crops better than the American spawn that I have. The temperature at which the building should be maintained is usually, in the early stages—it should be kept at about 65 degrees, although I have grown as fine mushrooms as I have ever grown at all at a temperature of 54 degrees, but you want to keep your temperature up a little at the start while the spawn is running. After

it has run and the mushrooms begin to show, you can very safely drop your temperature down to about 54 degrees. They won't come up quite as fast, but you will get finer and larger mushrooms at that period of growth.

We had on our place, after I got the mushroom fever, a plot I thought suitable and I conceived the idea of planting mushrooms in this part, and I have been exceedingly successful with them in a small way. I have no means of warming this place, so as the cold weather came on, they finally quit growing, and the beds finally froze up solid, as hard as stone.

We let them alone and this spring they thawed out and when the temperature arose to 50, the mushrooms began growing and they have grown remarkably fine mushrooms, and the temperature has never been up to 56 yet, and we are still getting a few of them although the beds are getting pretty well exhausted. The conclusion I have arrived at in the matter of temperature is, that after the mushroom spawn has run, 54 degrees is the better temperature to keep your room than probably any other temperature that you can keep it.

Now in the matter of watering and regulating your beds. Your mushrooms won't grow without water, and many growers water them, I think, about once a week, some with water tempered, others with the cold spring water that they may happen to have. My habit has been—we heat our house with hot water—my habit has been to use warm water; just simply take the chill off. You don't want to make your beds too wet, and yet you want to wet them enough. When it comes to the quantity of water that you should put in, I am frank to say that I don't know. I know that you don't want to keep the top of your beds too moist. You must thoroughly wet the manure all the way through, and the beds must be free from surface water, although I remember that on one occasion, when my beds were not producing very well, I watered them thoroughly and got a fine crop of mushrooms afterwards, so that the rules of the books do not always go in practical experience.

I presume the question would arise probably with some of you. What kind of a building will you put them in? The construction of those buildings that I have begun to use—they were mainly lumber buildings with double walls lined with building paper and made absolutely dark, and usually putting from five to seven beds into them in height, that is, the first bed being on the ground floor and so on up. That is the way we always do with the beds. Your bed that is down in the dirt will always yield you more mushrooms and it will last longer and bear longer than any other bed you may have in your house. The beds are put in on frame-work at a convenient distance for picking, between twenty and twenty-two inches

apart from the top of one bed to the bottom of the next. The beds are made about six feet wide; that is about as long as a man's arm is usually able to reach, and he reaches half way across the bed, goes up one aisle and picks what he can reach and then goes down the other aisle and picks from that. The building should be so arranged that an even temperature can be maintained. It should be heated uniformly. My building is heated with hot water, which I believe to furnish a rather more uniform temperature than any other process of heating. You do not want a dry heat like a fire would make; you want a damp, moist atmosphere. You want your room as near absolutely dark as you can have it. The mushroom is a plant or a fungi, or whatever you call it, that prefers to grow in the dark.

The matter of ventilation is an open question, a very decidedly open question. When I built my house, they told me that I should provide for thorough ventilation. Once when we had the dumps pretty badly—mushrooms have a lot of diseases that you have to look out for and take care of—one of my neighbors rather laughed at me and told me I hadn't ventilated enough and yet in this upright arch that I have there is not a bit of ventilation. There is an opening at the top that I could open and ventilate but it hasn't been open and ventilated since away last fall, when it froze up. I patched the door up until it was practically air tight. The rest of it is solid stone wall, and absolutely there has not been a bit of ventilation and yet I have grown the finest mushrooms I have had right in there. I know of another grower of mushrooms who has his beds entirely under ground, absolutely under ground and covered over, so that the sod and grass are growing on the top of them. He don't ventilate at all, and yet he grows exceptionally fine mushrooms and ships them all to the New York market, so that the question of ventilation, I say, is an open one. I do not know myself which is right, and which is not, although I provided for ventilation in my building, and whenever I could I have thrown the windows open; and it is provided with draft windows, and whenever I could I have thrown the windows wide open and I rather expect it is probably the right thing to do, because cold don't hurt the mushrooms even in winter weather. I am pretty well satisfied that you may freeze them solid because my experience has been that they will stand freezing without injury, in fact they will freeze as hard as frost can freeze them and yet when they thawed out they came right along and produced quite a fine crop afterwards.

Now I suppose that some of you would like to ask some questions, and I have but little more to say except that as soon as you have extracted all the nitrogen of the manure, that is one of the considerations, you have practically nothing left save what phosphoric

acid and potash and what vegetable matter there may be of which the manure is composed. I thought at first that this manure was of very little value; I do not think yet it is of very much value, still it may have some value. Last fall we hauled it out and spread it with a manure spreader on two fields, and this spring I can distinctly see the marks across one of the fields where this manure went, whether it is a matter of the humus or whether it is the phosphoric acid and potash that is left in it I can't say, although potash, as a rule, does no good on our place at home. I don't know whether there are any other points that I should have covered that I have not covered, but if you will ask me questions I will try to answer them.

COL. DEMMING: I would like to ask if Mr. Sharpless ever found poisonous mushrooms coming up in his beds?

MR. SHARPLESS: Yes, some little fellows came up, but nobody would mistake them for mushrooms at all; they are differently constituted. There is a wonderful variety of little fungi that grow up, long, hairy, beautiful little growths that grow to about that height, of white filmy stuff that also got little cups. They grow up to about one-eighth of an inch in height and form little black seeds in there. They come up sometimes with a round top that reaches down an inch or more, but nobody would ever mistake them for mushrooms, in fact, the edible variety of fungi is large. The ordinary puff ball which grows in the field, which sends out a sort of smoke when you step on it, in its earlier stages, is said to be a great deal better than the mushroom. The mushroom in the condition in which we pick it to send to market must be in a button form. If you send them down to market open they will tell you to pick them sooner, and yet nothing that I know of ever gets to perfection until it gets pretty nearly ripe. Your apple is not good until it is ripe, nor your peach nor your pear; neither is your mushroom. When we want to eat some at home we always pick out those that are ripe, but you can't send that kind to market. I think there is no danger whatever of ever raising any poisoned toadstool in your mushroom beds.

MR. SCHWARZ: During how long a season can you cut them?

MR. SHARPLESS: About from three to four months will take your crop out. Now while you are on that question, I will say this much further about the American spawn. From a bed of American spawn, as I said, I got three successive crops of very fine mushrooms and then they quit, absolutely quit; so I took the English spawn, and re-spawned those beds, and that was in Janaury, and they have not come yet. I presume the temperature has been too low for the spawn to run, although I have watered them and done everything

to them that I know how and they still have not come, and I suppose never will.

COL. DEMMING: The question was asked because I have had some experience in raising mushrooms, and I found out by my experience that there are some 1,100 varieties in the United States, and of the 1,100 varieties only ten are poisonous. I found, furthermore, that the greatest enemy of the mushroom is the wild rabbit.

MR. SHARPLESS: The wild rabbit don't get into our mushroom houses, and we have no trouble on that score. We don't grow toadstools and there is not any danger of getting poisonous toadstools mixed with marketable mushrooms. The great majority of fungi are edible and some of them are better than the mushrooms.

Questions and Answers on Prof. Robinson's Paper.

G. R. HENDRICKS: In the ordinary way of sowing clover seed on top of the soil exposed to the rays of the sun, is its usefulness impaired as an inoculative agent?

PROF. ROBINSON: For practical purposes, no. There will be enough bacteria uninjured to perform the office required.

MR. HENDRICKS: The Department of Agriculture in one of their circulars state that the inoculating material could be made up at a few cents per gallon. Why do the seed men ask two dollars per gallon?

PROF. ROBINSON: With reference to making up the solution in which the bacteria are grown, the "few cents a gallon" refers only to the cost of the nutrient salts, and does not include the production of the pure culture necessary as a "starter." As to the price of two dollars a gallon asked by the seed men, I think I can state that in another season the expense will be very much lower. Of course commercial production with advertising, postage, etc., entails expense that is higher than the expense to the Agricultural Department; still the expense is bound to come down very much.

MR. WAYCHOFF: Can simple directions be given by which the ordinary farmer can propagate his own nitro-cultures economically?

PROF. ROBINSON: That is impossible for the reason that the cultures can only be produced in a bacteriological laboratory. Of course when he has a dry culture for a starter with the special directions accompanying it he can make up his liquid culture, in a large amount at little expense.

MR. DRAKE: Will land produce a good crop of clover when the bacteria are not present in the soil?

PROF. ROBINSON: Yes, if there is sufficient nitrogen in the soil for the plants to feed on, a good crop may be produced, but growth is more normal and healthy when the bacteria are present to assist.

MR. NAGINEY: What time would you recommend for sowing inoculated seed and soil for alfalfa?

PROF. ROBINSON: Probably late in the spring would be the best time for sowing for this latitude, although fall sowing of alfalfa has done very well in many cases.

MR. WAGNER: Would not the best culture for alfalfa be cultivated by growing Bokhara or sweet clover in a clean healthy soil?

PROF. ROBINSON: Provided the other conditions of the soil were suitable, the sweet clover bacteria would favor the alfalfa.

MR. GLOVER: In this latitude would you prefer a seeding of alfalfa in spring or fall and with or without a nurse crop?

PROF. ROBINSON: At the ordinary time of sowing in this latitude, without a nurse crop. Be sure to have it free from weeds. It is probable that late spring sowing is preferable for this latitude, although in many cases it has been shown that alfalfa does very well when sown in the fall.

PROF. SURFACE: How long will the bacteria exist in the soil without leguminous roots on which to multiply?

PROF. ROBINSON: Probably from four to five years. That is a matter that has never been thoroughly worked out; it is very hard to say.

MR. MILLER: Can we get cultures from the National Department of Agriculture at anytime?

PROF. ROBINSON: Well, for instance, just at present we are unable to promise them; up to July 1, we have listed ahead practically all that we can send out. More will be sent out this fall, however.

MR. SEEDS: Can you tell why it is that some legumes do well and prosper without getting nodules on the roots?

PROF. ROBINSON: It must be because they have an adequate amount of nitrogen in the soil.

PROF. BUTZ: What can you say as to the character of the cultures that are sent out by the seed houses?

PROF. ROBINSON: Well, of course, we cannot guarantee them any more than we can guarantee their seed. We intend to keep track of these things; so far as our examination has gone up to this time, we have no reason to believe that they are not being properly prepared.

A Member: Would you expect in growing a leguminous crop upon a fairly fertile soil and where presumably the bacteria were not present that the crop would be benefited from the use of inoculation?

PROF. ROBINSON: For a leguminous crop?

A Member: Yes.

PROF. ROBINSON: I should, yes, other conditions being right.

A Member: Do you think that the influence of bacteria just at that time is beneficial and likely to increase the crop?

PROF. ROBINSON: I think that is probably so.

PROF. SURFACE: Can we get a proper variety of bacteria for inoculating San foin?

PROF. ROBINSON: We have had a culture for San foin but it is not now active.

PROF. SURFACE: Will the varieties for red clover, alfalfa and soy beans do for this?

PROF. ROBINSON: Probably not. A specific culture is much more satisfactory and will give better results within the same length of time.

MR. M. P. HALLOWELL: Where can alfalfa inoculation be obtained and how much is needed per acre?

PROF. ROBINSON: A gallon of solution will treat about two bushels of seed; a quart of solution will treat enough for one acre at least. It is obtainable from the Department of Agriculture if you apply in time. There are several laboratories sending it out.

MR. CHARLES MILLER: Describe what specific eliminative effect soil inoculation by bacteria may have, if any, upon acid soils? In other words, will it tend to extinguish sorrel or weeds of a kindred nature?

PROF. ROBINSON: It will not. In such a case it will be necessary to correct this condition by some suitable agent, such as lime.

MR. AGEE: We farmers have learned to look to our experiment stations for tests in the new things. Now in Bulletin No. 214, I see but one report from an experiment station concerning the cultures sent out to the various stations. Could you tell us what the reports from the stations were, whether the reports were generally favorable or unfavorable.

PROF. ROBINSON: We did not get very complete returns; we had quite a voluminous report after the bulletin was out from Alabama. It was generally unfavorable, due to soil and climatic conditions.

MR. AGEE: I saw a report from only one station from all over the United States.

PROF. ROBINSON: There were two station reports included in the bulletin; others received up to that time, not more than four or five, were indecisive.

Questions and Answers on Prof. Wells W. Cooke's Paper.

MR. McCLELLAN: Is there any way of hastening the action of the nitrogen contained in the solid manure so as to make it available as plant food?

MR. AGEE: I was struck with the name that was added to that question, that is from my friend Mr. McClellan, up in Knox, Pennsylvania. You that have been up through his county, Clarion county, know that he is up on the roof of the world and the season is so short that I don't wonder that he wants something to hurry up the action of farm manure. He can do that by applying the same method used in England in a similar climate, that is by the composting of the manure. Down in the southern part of the State where the season is longer, that is just what you don't want to do. You want to save every bit of the organic matter, vegetable matter, as well as the plant food, and you better let the action of the manure be a little slower in order to save the organic matter rather than to undertake to hurry it up by composting the manure beforehand.

MR. SEEDS: Does the colored water running out of the barnyard take away the fertility, and can land be cropped and made fertile without concentrated fertilizer or barnyard manure?

PROF. COOKE: It probably does; wherever you see colored water running out of a barnyard, you may be sure that some plant food is connected with it because there is no soil there; nothing to catch and filter any of the plant food running out of that colored water, but when you see colored water running away from a field, it does not necessarily follow that plant food is being lost, because if that colored water is running over soil, the chances are that the soil has taken out the larger part of the plant food.

MR. GLOVER: Can the fertility of a farm be maintained without the aid of commercial fertilizers by feeding the hay, clover and timothy and fodder on the farm and converting all the straw to

manure, when there is a loss of the part of the liquid manure in the stables or in the yard? Will green crops plowed under help out in this case?

PROF. COOKE: I have another question here that is substantially like that; contains about the same idea.

"Is there any way of building up a farm without putting anything on it, without commercial fertilizer or barnyard manure?"

Well, there is if you want to take time enough to do it. If you are willing to wait to build it up slowly enough, but I doubt whether we can afford to wait for that, building up by a longer and slower process to enable us to attain this end.

To go back a couple of hundred years, it was then customary to turn the land out and let it lie fallow until such a time as Nature would help to bring it up, but in this modern generation we have given up the fallowing of land, and I think it is better to add something to it and hurry up the process.

A Member: How can a farmer successfully conduct his affairs and produce his crops without a greater knowledge of chemistry; and how can a farmer successfully fertilize his soil without being able to ascertain the proportion of plant food the soil is deficient in?

PROF. COOKE: Well, the idea that I attempted to convey in my remarks was, that the amount of plant food that was in the soil is just so much, and we are to keep adding to that as we take off crops from the soil, so that whatever you think your crop is carrying away, you add to it; be sure that you have got enough there; it does not make any difference if you have got a surplus; the more the better.

A Member: Would you be governed entirely by the composition of the crops to be raised as to what you would apply?

PROF. COOKE: The first year the application would be merely to put on enough; be sure that I had enough, if I was going to put on potash I should do as I have done a good many times; I should—

A Member: What would you do the second year?

PROF. COOKE: After I was sure that there was plenty there, then I should be governed largely by the amount of plant food that I considered had been extracted from the farm by the crops; after I got enough so that I knew there was plenty in there, I should be governed by the amount I considered had been taken off.

Several members questioned whether fertilizers would not be wasted if applied in the way advised by Prof. Cooke in his paper, to which Prof. Cooke replied in substance as follows:

PROF. COOKE: I think you must have misunderstood what I intended. I think you misunderstood what I meant as to nitrogen being just as good for one plant as for another. A pound of phosphoric acid is just as good for one plant as it is for another. These plants may want different quantities. There may be forty pounds of phosphoric acid available in a given field and that might be enough for a crop of corn where it would not be enough for a crop of wheat. A pound of phosphoric acid would be good for one or the other, only they may be different in the quantity they want.

MR. SEEDS: A man might waste a great deal of plant food because he don't know how much to put on.

PROF. COOKE: So far as the phosphoric acid and potash are concerned, they are not wasted. They are there. Their action is just postponed until they are needed.

MR. HALLOWELL: What commercial value has the clover root?

PROF. COOKE: As I stated, the analysis of clover root is not much different from the clover top, so that a ton of dry clover root has about the same value as dry clover hay.

MR. SHARPLESS: Explain the action of land plaster on the soil.

PROF. COOKE: Well, that has a sort of double use. Land plaster has some effect toward conserving moisture. It rather tends to catch and hold moisture and helps to carry the plant through a dry time.

Evening Session, Wednesday, May 24, 1905.

J. Milton Lutz, Chairman, called the meeting to order at 7:30 o'clock.

The CHAIR: We will now be entertained with a whistling solo by Miss May Stewart Smith.

Miss Smith rendered a whistling chorus, "Maid of Dundee," and responded to an encore by giving the familiar air, "Comin' Thro' the Rye." Miss Mary Elree acted as accompanist.

The CHAIR: We will now be entertained with a violin solo by Miss Cooley, of Downingtown.

Miss Cooley played a violin solo which was well received. Her accompanist was Miss Irwin, also of Downingtown.

Discussion of Prof. Cooke's paper was resumed:

MR. STOUT: Is it advisable to apply as much as a ton or more of nitrate soda at once on an acre of asparagus?

PROF. COOKE: I should say not. There is no acre of asparagus that can come anywhere near using that much nitrate of soda. It is customary to put on more nitrate of soda than the crop can use up, putting it on so that we can be sure of having enough.

MR. WAGNER: Is not the soluble mineral matter of potash and phosphoric acid lost in the liquid manure if applied to a soil, especially on hillsides, when there is no plant growth to take it up and heavy rainfall to carry it off?

PROF. COOKE: Not if the soil is in such condition that the liquid manure can ever get into the soil. Of course if the hillside is very steep and then a heavy rainfall comes so as to wash the whole thing off the hill, it will be lost.

A Member: Can the fertility of a farm be retained without the aid of commercial fertilizers by feeding the hay and fodder on the farm?

PROF. COOKE: You can't build up a farm unless you bring something from the outside or else save every bit of the fertility produced on the farm; even then the process of building up will be very slow.

A Member: Will corn crops plowed under help out in this case?

PROF. COOKE: What you are doing in all this sort of operation is, merely helping to set free the plant food that is already in the soil. You are not adding anything; you can't build up the amount of plant food there in that way; the most that you can do is to keep the farm from running down.

MR. PERHAM: Is it advisable to sow nitrate of soda on sod for growing grass?

PROF. COOKE: Nitrate of soda is an expensive plant food. Hay is one of the comparatively cheap crops, and I very much doubt if there are many conditions in Pennsylvania where a person can afford to pay for nitrate of soda to raise grass.

A Member: Will Nature not take care of the soil and make it better at all times where man does not interfere?

PROF. COOKE: If you turn the soil out and leave it to itself, it does improve in the sense that some plant food there becomes available; it is a very slow way, though, of doing it.

A Member: Does not Nature make new soil and hence new available plant food from the rocky crust of the earth?

PROF. COOKE: It does, but this is too slow for our modern agricultural methods.

MR. B. F. KILLAM: Do we get proper plant food by using commercial fertilizers in sufficient quantities?

PROF. COOKE: So far as the mere plant food is concerned commercial fertilizers fill the bill completely, but that is only one-half of the story in the successful growth of crops. We must have a proper mechanical condition of the soil, and that is controlled by filling the soil with humus, so that if we want to raise crops on commercial fertilizer, we will in some way or other have to provide for the getting of vegetable organic matter into the soil. The commercial fertilizer is all right as the source of nitrogen and potash.

MR. SEEDS: Would you say that nitrate of soda or potash on clover—that nitrate of soda would not be of any use to the clover if it had once gotten a start, as we were informed this forenoon, if it had the nitrifying bacteria on its roots?

PROF. COOKE: The potash is a direct food to the clover and the clover needs potash more than any other of the plant foods.

The CHAIR: You will next be entertained with a talk on the "Consolidation of Rural Schools," by Mrs. Mary A. Wallace, of Ellwood City, Pennsylvania.

The paper read by Mrs. Wallace is as follows:

CONSOLIDATION OF RURAL SCHOOLS.

BY MRS. MARY A. WALLACE, *Ellwood City, Pa.*

Before beginning a discussion of the subject assigned me this evening, I desire to say that it is one in which I am intensely interested. I am not of those who think that whatever was good enough for them when they were children should be good enough for the children of the present day. If it had not been for the great, progressive, far-seeing minds of the past, what think you would have been the condition of our country to-day? And next in importance to the conception of the Declaration of Independence, was that of our free educational system. It was an innovation, a startling innovation on the old plan, when facilities for giving children an education were only within reach of monied families. The idea of taxing all to educate all was for a long time unpopular, but when men learned by observation, that our institutions could only be main-

tained by the spread of intelligence among the masses, all intelligent opposition ceased.

The school and the State are interwoven in the texture of our Constitution, and government and education are the cause and consequence of each other. The destiny of the nation, and the destiny of the common school are one and inseparable; maintain the one and you uphold the other. I believe that in the years to come when great empires and kingdoms shall be wrecked amid the storms and cyclones of revolution, this Republic will stand securely, so long as our public schools are managed wisely and well. If education had been left to the family, all the languages, the traditions and customs of the old world, would have been transplanted with new life into our American Republic, and instead of being one people, with one language, we would soon have become a people of many languages, and divers customs equal to, if not worse than Russia to-day, with her numerous dialects, and a dozen distinct languages. For several years I happened to be what was designated "educational editor" of a Pittsburg daily newspaper. One of my duties as such, was to visit all the schools of the city at least once each year, and of course "write them up" for publication. I wish friends that you could all go with me to some of the ward schools in the down town districts of that great Western Pennsylvania city, that you might see the children of the German, the Frenchman, the Italian, the Hungarian and the Slav, and of foreigners from every clime, yielding up the language and traditions of their fathers and paying willing homage at the shrine of our ancestral Saxon. In thus calling your attention to the mighty influences of the public school, I have digressed somewhat from my subject, for which I hope for your pardon.

The more important problem for rural communities to solve to-day, is not how to grow alfalfa, nor how much lime should be applied to an acre, nor any of the many agricultural problems discussed at our Institutes, but it is how best to secure the benefits of a graded school system for the farm children. I would impress this thought upon you, that the more important problem for rural communities to solve at the present time, is how best to secure the benefits of a graded school system for the farm children, and instruction in the higher branches of learning, without them being obliged to go from home. Many farmers do not feel able, in fact, have not the means to send their children away to school, and others do not find it desirable to change their place of residence as some do in order to give their children a better education, than the rural schools afford and consequently, as Dr. Schaeffer, our Superintendent of Public Instruction aptly says in one of his reports: "The larger educational advantages are limited to a very few of the boys and girls upon the farm. I believe that consolidation of rural schools will solve this

problem, and that when it comes to pass in Pennsylvania we shall see results in better country schools, and broadened opportunities for our young people, and such an uplift to the social life of the farm, as no other reform can bring to it."

At a meeting of the National Council of Education a few years ago in Denver, Colo., a committee famous in educational circles as "The Committee of Twelve on Rural Schools," was appointed to investigate and report on this subject. The committee was composed of leading educators, Hon. W. T. Harris, United States Commissioner of Education being a member. After a most thorough examination into the conditions of the rural schools of the United States, the committee, in a summary of a more exhaustive report, said: "One of the great hindrances to the improvement of the rural school lies in its isolation, and its inability to furnish the pupil that stimulative influence that comes from contact with others of his own age and advancement. The committee, therefore, recommends the collecting of pupils from small schools into larger, and paying from the public funds, for their transportation, believing that in this way, better teachers can be provided and more rational methods of instruction adopted, and at the same time the expense of the schools be materially lessened."

Prof. L. D. Harvey, of Wisconsin, while Supt. of Public Instruction in that State, made a more careful investigation of the consolidated plan, and his conclusions as published were, that the health of the children is better, they being less exposed to stormy weather, and avoid sitting in damp clothing. Attendance is from 50 to 150 per cent. greater, more regular and of longer continuance, and there is neither tardiness nor truancy. Pupils work in graded schools, and both teachers and pupils are under systematic and closer supervision. Pupils are in better schoolhouses, where there is better lighting, heating and ventilation, and more appliances of all kinds. Fewer teachers are required, so better teachers may be secured, and better wages paid. Better opportunity is offered for special work. Cost in nearly all cases is reduced. Pupils are benefited by a wider circle of acquaintance and the culture resulting therefrom. The whole community is drawn together. Public conveyances used for carrying children to school in the daytime may be used to transport their parents in the evenings, to public gatherings, lecture courses, musicals, etc. Finally, he says, by transportation, the farm becomes the ideal place to bring up children, enabling them to secure the advantages of centers of population, and spend their evenings and holiday time in the country, in contact with nature and plenty of work, instead of idly loafing about town.

I hope friends you will bear with me a little longer, while I quote from the University of Illinois Bulletin on this subject, issued last

December. This bulletin was issued in response to a resolution adopted by the Farmers' Institute of Illinois requesting the Agricultural College of the University to collect and publish exact information relating to the methods, the difficulties, and the advantages of the consolidation of the country schools. Referring to what has been done the bulletin says: "From the various sources of information consulted, it appears that consolidation commenced in Massachusetts under the law of 1869, and was first operative in Quincy in 1874, since which time more than 65 per cent. of the townships have found it advantageous to consolidate some schools." In 1893, Supt. Rockwell wrote: "For eighteen years we have had the best attendance from transported children. No more sickness among them, and no accidents. The children like the plan exceedingly. We have saved the townships at least \$600 per year." From these and independent centers, the plan has spread until it is in operation to a greater or less extent in twenty states, not of a single section of the Union but of all sections. Among the conclusions arrived at are these:

At least one-third of the country schools are too small to be even fairly successful. The best teachers are taken for the graded schools, and of those available, for country schools from 50 to 75 per cent. are young girls with no more training than is given in the school they are to attempt to teach. As conditions exist to-day little children walk long distances, and suffer much discomfort and ill health by reason of exposure to storms, and from sitting all day with wet feet and damp clothing, after wading through snow drifts, slush and mud on the way to school. The only humane way of putting children of all ages and conditions into school, through all kinds of weather, is to transport them in wagons that are covered, and when necessary, warmed. Consolidation and transportation tend greatly to lessen expense, so that the same grade of schools can be had much cheaper, or a far better grade at the same expense, as patrons may desire, or if they please, a full equivalent of the best city schools may be established and conducted at slightly greater cost and at a much lower rate than in the city. As things are to-day, without consolidation, country people pay more for elementary instruction alone, than the city schools cost, including the high school course; but in addition, farmers pay vast sums for tuition and other expenses of their older children attending city schools for what is not offered at home. Consolidation is the only way of securing really good country schools and it is the only means of introducing the study of agriculture generally into our public schools. The objections offered in advance of trial are mostly either fanciful or selfish, and are not realized in practice. Consolidation is the only plan tried or proposed, by which the country child can secure such an education, as modern conditions demand and such as is already afforded the city child. It

lessens the expense and equalizes the cost; it protects the health and morals of the child and makes the introduction of the study of agriculture and other industries possible; it enhances the value of farm property as a whole; it brightens and broadens country life; it preserves its virility unimpaired and rationalizes the movement toward population centers. Such difficulties as are found, are trivial or transient or both and would not stand in the way of any commercial enterprise for a moment. Consolidation of country schools is the solution of the problem of agricultural education. *No school that has once tried it has ever gone back to the old way.*

In our neighboring State of Ohio, particularly in the Western Reserve district, consolidation has been tried, and is giving entire satisfaction. Speaking of the work in Ohio, Hon. O. E. Bradfute, former president of the State Farmers' Institute, in a recent interview said: "I do not think I can advocate too strongly the plan of the centralized school. It was not an easy thing to bring about this idea. There are many people in Ohio to-day who are afraid to tackle this question, but I can say with confidence that we now have a nucleus, especially up in the Western Reserve, from which we can work, and the idea is fast spreading all over the State. We have established enough, so that we know the schools are bound to be a success. I can truthfully say, that in Ohio we are beginning to regard centralization, as something like the measles—catching."

I sincerely hope, friends, that the germ or microbe, may be wafted across the border into Pennsylvania, and that every farmer in the State may become so inoculated with it, that an epidemic of consolidation will sweep over this entire Commonwealth very soon.

I have shown by the most reliable testimony that consolidation is proving all that its most enthusiastic advocates claimed it would accomplish, and what others can do, why not we of Pennsylvania? Is this grand old Keystone State, to lag behind in the march of educational progress? As Dr. Schaeffer in one of his reports well says: "Our American farmer should be made to realize that the public school is his very ark of safety, the bridge across which his little ones may reach place and power, and higher planes of usefulness. He should demand school advantages for his children equal at least to those of the city, that will equip them for a fair chance of success in the race of life."

The question that now presents itself is, What is the best method for the farmer to adopt to bring about this desired end? The answer is easily given. Simply agitate the subject of consolidation and elect broad-minded, intelligent, progressive men—and women school directors. There are, and have been two potent influences tending to prevent the realization of the possibilities of our public school system. One is such a development of the public conscience, as allows

school officers to subserve the interests of a political machine, and the other is the almost universal *man* management of our schools. If there is one thing more than another upon which our present day politics should not be permitted to lay its hand, it is our public schools. Its effect is ever baneful.

The second influence referred to, the ignoring of women in school offices, is depriving the State of the services of many of her most loyal citizens. Every one admits woman's interest in education. Even the most conservative will grant that the training of the young, is not only her privilege but her duty. You will say that women are largely employed as teachers. True, but why not give them a voice in the management of the schools. Then too, how many times, think you, would the young woman teacher be delighted, and her heart lifted of a heavy burden, if she could but consult a woman director in regard to matters which affect her pupils, but which her youthful modesty will not permit her to bring to the attention of a board composed entirely of men. The most important office in the whole school system is that of director. He is a power in his way, and he should be equipped with a liberal education, a knowledge of up-to-date educational methods, interest in the schools, and a belief in their possibilities, a knowledge of child-nature and sufficient leisure to devote to the various duties of the office. Few men, granting them all the other qualifications, know children as do women, or have such an appreciation of children's needs as is necessary in the ideal school director, while very many do not have the time to devote to looking after the welfare of the schools or to give them that thought which they demand. At the same time there are women of culture and experience in educational matters, in almost every community, ready and willing to serve their State in this way, but their services are not only not asked for but not accepted when offered, as has been demonstrated many times within recent years. But when we recall that school directors are elected by men and that the office is very widely considered the lawful prey of the politician—the earnest of greater political favors—it is no wonder the advocates of woman suffrage tell us that nothing short of franchise in the hands of women, can bring about this necessary reform. However, I am not yet an avowed woman suffragist, and believe that when the attention of the voters is called to this matter they will see the error of their way, will see the mistake they have been making, in thus ignoring women. But if they do not, and will continue to be so selfish in this matter, I will heartily favor an act making it obligatory upon them to elect and keep on every board of school control a certain number of women. The law making them eligible to the position should have thus provided for their election. I trust, friends, that

you will pardon this seeming digression from my subject, for I assure you it has a more important bearing upon it.

The consolidation of rural schools is a matter that should call for more universal co-operation among the men and women of the farm. No other question has larger meaning to the future of the young folks than this. Shall the farm boy and girl be deprived of the school advantages so freely offered their city brethren? This is the question for you fathers and mothers to answer. There are, however, honest differences of opinion in regard to nearly all public measures. Our common school system began its great work amid strenuous opposition from mistaken men, who little dreamed of the great good to be accomplished through its instrumentality. They saw not the wise policy kept in view by the supporters of the system. But little by little the work of the system began to speak for itself, and so it is with consolidation, it is speaking for itself. It is past the experimental stage, and all true friends of education, and of the country children, should stand together in a spirit of liberality and broad-mindedness and do every thing possible with an eye single to the best interests of the rural schools. This is an age of progress. We cannot, we must not stand perfectly still, nor should we rest until the rural schools of Pennsylvania are equal if not better than any in the United States. And, friends, only by consolidation, as I see it, can this be accomplished, for then our schools will be graded and the children will pass up through the primary, the intermediate and grammar grades, into the high school, and to the curriculum of the rural schools of to-day, will be added Nature study, domestic science, manual training, music, drawing, etc.

And what of the township high school? Not one of us, I fear realize its importance, the untold benefit and advantages it would bring to our boys and girls. Dr. Harris, whom I have already quoted, in comparing the chances of a boy with only a common school education, and the graduates of a high school, tell us, that the chances of success of the one with a common school education, in round numbers, is one chance in 9,000, while the boy graduated from the high school has one chance in 400, increasing his chances 22 times. Now friends do we not want to give our children all the chances for success possible? Are the children of the city to be given opportunities denied the children of the country? "Equal opportunities for all, special privileges for none" should be our watchword in this campaign for better rural schools. By consolidation, enough money will be saved each township, according to reliable statistics, to almost, if not altogether meet the expenses of the high school. But if another mill or two should be added to your school tax the first

year or two, for building purposes what of that? You cannot give an extra dollar or two, or five, for a better purpose.

In closing, I am going to ask you all, friends and co-workers in the field of agriculture gathered here from every section of this great State, to resolve to-night, here in the land of Penn, and almost under the shadow of Independence Hall, to do all you possibly can to bring about this glorious day for the farm children of Pennsylvania. A heavy responsibility rests upon you in this matter. You should not, oh, you must not, open the golden gate of the future for our boys and girls, with the old rusty keys of the past, but advance the standard of the rural schools onward and upward, keeping step with the march of intellectual progress in this 20th century, and stop not until you have placed it on the high ground of consolidation. For the children of the farm I plead.

The CHAIR: We will now be entertained with a vocal solo by Mr. Clayton.

Mr. Lewis Clayton, of Fox Croft Grange sang "The Land o' the Leal," which was received with warm applause. The audience was so well pleased that a second selection was insisted upon and courteously granted. He was accompanied by Miss Irwin.

The CHAIR: The next thing in order will be an address by Prof. John Hamilton, of the Department of Agriculture, Washington, D. C., entitled, "The Farmers' Institutes—Their Value and Place in Public Education."

Prof. Hamilton opened his address by speaking in strong terms of approval of the paper read by Mrs. Mary A. Wallace, and stated that it was a question that lay at the bottom, or that was fundamental as related to our common schools.

Prof. Hamilton's address is as follows:

FARMERS' INSTITUTES, THEIR VALUE AND THEIR PLACE IN PUBLIC EDUCATION.

BY PROF. JOHN HAMILTON, *Farmers' Institute Specialist, Washington, D. C.*

I wish at the outset to make the assertion that the State has not done its whole duty to its citizens until it has made provision for the educational development of the entire population. Has offered education sufficient in extent, and of such a character, as will enable

every adult, of good health and sound mind, to be self-supporting. He shall not only be self-supporting, but have sufficient reserve earning power to enable him to provide, in addition to his own support, for the maintenance of at least two others, who are unable to maintain themselves.

We are accustomed to think of education for the public as being solely for children and youth. Accordingly in most of our States the school age is limited by law to the period between five and eighteen years for the common schools.

The great body of this work should be done in the public schools while the pupils are young, but when this has been neglected, as is the case all over the United States, to-day, then it should be extended to the adult worker outside wherever it can possibly be done.

PUBLIC EDUCATION.

By "Public Education" is understood education at the public expense. A not inconsiderable portion of our citizens maintain that the public is not justified in adding to its tax by supporting the higher institutions of learning such as the high schools, academies and colleges. They hold that expenditure by the public for education should be limited to the cost of giving elementary instruction, including only the necessary branches of reading, writing, arithmetic, geography and English grammar, with perhaps a little physiology and history. These conservative citizens also declare that taxation, for education in the common schools, is only justified on the ground that some educational training is necessary in order to fit men for citizenship, and that the elementary branches just enumerated are all that are necessary in order to effect this. That when these are offered the public has done its full duty to the individual and to the State.

Progressive educators, on the other hand, hold that fitness for citizenship is not complete when men have simply learned how to read and write, and interpret the Constitution of the United States, qualifications enabling them to vote, but that it embraces also the additional training necessary in order that they may be self-supporting. In other words, that the object for which the school is established is not accomplished, until it has taught the individual how to make a living for himself, and to support at least two other helpless persons dependent upon each wage earner for food, raiment, shelter and education.

If the latter interpretation is correct, then Public Education is for not simply the few who are in the public schools, but extends to the entire body of our people and it is not confined to a meager list of elementary studies, but includes those that belong to a liberal course.

embracing many practical subjects as well. The purpose is to fit the students for becoming productive members of the State.

The National Government has defined its position on this subject, at least so far as relates to agriculture and the mechanic arts, by establishing in the several states, from the public funds, colleges for the higher education of the people, and by endowing experiment stations, for conducting scientific investigations in agriculture, in maintaining the National Department of Agriculture at Washington, and in distributing to the public the information which these institutions collect. The principle, therefore, that it is proper to appropriate public money for education, outside of that given for the support of the old time common or public school, is recognized by highest authority.

COUNTRY CHILDREN.

The last census gives the total number of children in the United States, between five and eighteen years, at 21,404,322, out of a total population of 76,303,387. There are in the country 5,700,341 farm homes. The average number of occupants for each home, is given at four and six-tenths (4.6) persons. This makes the total agricultural population of the country, living in farm homes, about 26,221,568, or thirty-four and thirty-six hundredths (34.36) per cent. of the entire population. The proportion of children to the total population is, therefore, twenty-eight (28) per cent. Carrying this same proportion into the calculation of the number between the ages of five and eighteen years in farm homes, we have a total of 7,342,039 children of school age belonging to the farm families of the United States, which leaves as the number of adults in farm homes 18,879,529. These last are all out of school excepting the few that are in the academies and colleges.

ORGANIZATION OF THE INSTITUTE.

For those who are engaged in agriculture, the Farmers' Institute has been organized. It is a school, not an entertainment or minstrel show, or an arena for clowns to display their antics, but a school of practical science of high grade. A school in which are gathered the working farmers, housewives and farmers children, for the study of the problems that confront them in the prosecution of their art.

The Institute undertakes to instruct these farmers, by having such facts, relating to agriculture, as have been discovered and demonstrated to be most valuable for their use, presented and explained, and by showing how these discoveries of science may be applied to the improvement of the farmers' methods so as to enable him to increase his product with the least effort and expense.

It differs from the ordinary public school, as well as from the normal school and college, in that it does not take up the systematic and exhaustive study of the topic which it undertakes to teach, but merely calls attention to the valuable features which the subject contains, and then refers the scholar to reliable publications, or other sources of information, for the more full, complete and itemized verification of the facts. The Institute is not intended to satisfy, but rather to excite, and stimulate inquiry. To raise questions in the working farmer's mind that will give him no rest until he shall have investigated them for himself, and has proven to his own satisfaction by actual demonstration in the field, the truth or falsity of that which he has been called upon to adopt. The purpose of the Institute is to cause the farmer to think. To think for himself, rather than to accept, without question, that which others assert as being gospel truth.

VALUE OF THE INSTITUTE.

The value of the Farmers' Institutes has been fully demonstrated. They started from small beginnings, and have been developed within the past twenty years, until last year they were held in all of the states except two, and in all of the territories except Alaska and Porto Rico, and they reached almost a million of the farming people of this country. They had in their employ 900 lecturers, many of whom are among the most capable scientists in the land. The Institutes were organized to meet a demand on the part of the agricultural people for information. So long as our soil was new and consequently fertile, rural life inexpensive and simple, labor plenty and cheap, land to be had for a dollar or two per acre, insect enemies almost unknown, crops abundant, luxuriant pasture to be had at almost no cost to the owner of the stock, so long as these conditions prevailed, the need for information in regard to agriculture was not felt. Any one could farm.

CHANGE IN FARM CONDITIONS.

All this has been changed. Good land is no longer cheap; soils are no longer virgin; labor is no longer abundant; life is no longer simple; the purchasing public are no longer indifferent to the quality and appearance of our products. We have begun to realize the fact that we do not understand our business, at least not sufficiently so, as to successfully meet the changed conditions. Men have been, and still are, anxiously inquiring what they must do to be saved from the sheriff's hammer, how they shall restore their impoverished soil, how they shall select their seed, what crops they shall cultivate, what breeds of animals they shall rear, what fertilizers they

shall use, how the scarcity and increased cost of farm labor shall be met, how insect enemies shall be controlled, how fungus growths shall be overcome, how our animals shall be protected against the disease germs that abound on every hand and threaten the destruction of our herds, what we shall do to secure moisture for our crops, and where profitable markets can be found? These and many other questions, equally pressing and important, have come to distress the modern tiller of the soil, and now the man who once had no anxiety or care with respect to his ability to gain a livelihood from his farm, is most seriously concerned as to what he shall do to insure certain and profitable crops from his rapidly deteriorating fields. Many, some years ago, became desperate in their sense of helplessness and inability to cope with the difficulties that surrounded them. Not a few permitted themselves to be led by ignorant and loud demagogues into many foolish and ill-considered ways, in the hope of some relief, would speedily be found either in politics or in greenbacks, or silver or gold. Like persons who are desperately sick, they were willing to try any nostrum which any irresponsible charlatan might suggest. Like drowning men, they clutched at any support, even a straw, in the hope that it would sustain them until some one appeared to rescue them from their peril.

WHAT THE INSTITUTE DOES.

The Farmers' Institute has come. It throws out life buoys to these sinking men in the shape of valuable information which they can seize and use. Some are laying hold on it and gradually it is aiding them to regain the solid ground.

What does the Institute do for a man? It teaches the farmer how to discover the unprofitable cow; how to furnish a cheap and well-adjusted ration, adapted to the securing of the particular product which he desires. The Institute teaches him what to plant, and how, and when and why, how to plow and how to cultivate his soil, the reason for every operation, and the purpose that it is intended to subserve. It teaches him how to preserve his crops, how to market them in good condition so as to bring the highest price, how, most economically, to fertilize his fields, so as to cause them to produce larger crops year after year, and steadily improve. It shows him how to subdue the insect pests that threaten to destroy his fruit and grain; how to breed his cows for milk, or butter, or cheese; his sheep for wool or mutton; his horses for draft or speed; his swine for bacon, or lard, or ham; his poultry for eggs, or meat, or both. In short, it comes to the man in need, and cheers him up with hope by teaching him the secrets of his art. It instills courage into his heart, strength into his arm, brings joy into his life because

he now sees the demon of debt gradually disappearing, and comfort and prosperity abiding in his home. The Institute does this, or that which the Institute brings to him enables him to do all this, and its influence sends him forth to his work with higher aspirations, nobler purposes, and a firm determination to succeed.

The Institute causes him also to respect his calling. Too many farmers have despised and hated their occupation instead of loving and cherishing it. The Institute presents agriculture in its true attire as one of the learned professions, noble, profitable and independent. Causes him to appreciate its worth, and induces him to commend it to his children, for a life pursuit. It is valuable to him, because it brings him knowledge. A kind of knowledge that he specially needs, that he can use and that he can get nowhere else. Knowledge that emancipates him from fear, that releases him from the helplessness that ignorance of his art has caused. He is no longer a slave to a dull, uninteresting and unprofitable pursuit, but he is a free man, wide awake, confident, able to cope with the world and again to stand independent among men.

THE INSTITUTE AND THE STATE.

The Institute is also valuable to the State. The welfare and perpetuity of the State, is directly dependent upon the intelligence and prosperity of the farming population. This declaration is so manifestly true as to need no proof. Every public man whose opinion is worth quoting, and who has declared himself on the question, has unqualifiedly endorsed this truth.

The natural tendency of men is to fall into a rut or mechanical routine. A man perhaps has carefully thought out a course of action, has started successfully in life, and hopes, by continuing the same methods which he has adopted, to continue to succeed. Too frequently this over-confidence results in his ceasing to study his occupation, and to keep informed as to the new methods, and the new conditions which may arise and which affect his business. He forgets, that "eternal vigilance" is the price of success in agriculture, as well as in politics, and by neglecting this sound maxim he gradually loses ground in the agricultural race.

The Institute comes and wakes this individual up, opens to him new lines of thought, suggests improved methods in practice, warns him against dangers, stimulates his intellectual faculties, and fills him with ideas sufficient to occupy his waking hours. He puts some of his thinking into his crops, some into stock, implements, fertilizers, family, country roads, rural schools and as his thinking develops into fruit, it is seen by others, and his example sets his neighbor likewise at work. He becomes a factor in his local government,

His influence extends into the legislation that is to control the country, and when this occurs he is unaffected by the temptations of public life that cause many city men to fall. The necessity for money with which to live, and the inordinate desire for holding office as a means of living, do not control his vote. He can live without the office. He regards public service as a duty which he assumes as any other, and relinquishes as soon as the need for his service is past.

RURAL POPULATION, SAFEGUARD FOR THE STATE.

In all history there is no record of the country population causing the destruction of the nation through the practice of the vices that enervate mankind, or the crimes that render life and property insecure. States have always been destroyed by their cities. These gradually absorb the country, and being compact, and having no interests excepting those of self, they grow narrow in thought, low in ideals, and corrupt in administration, until like Sodom and Gomorrah, their sin becomes unbearable, and they are destroyed in much the same way as those corrupt cities of the Plain, by a destruction overwhelming and complete. Babylon, Jerusalem, Nineveh, Carthage, Rome, Athens, Tyre, Memphis, Ephesus, Troy and Corinth, one fate befell them all, and the causes of their overthrow were alike—a city population, with a country given over to a peasantry too ignorant to govern, and too indifferent to care. Should this country be guilty of like disregard of the interests of her rural population, a like end will unquestionably result.

The remedy for all of the ills which befell the ancient countries and caused their final overthrow, lies in the proper education of the rural people. Make the country habitable, by making agriculture a profitable and interesting occupation, so that those who love their family in preference to the club, will continue in sufficient number to shape our religious life, and control the political future of the State.

An industry with 26,000,000 of people in its employ, and of this almost 19,000,000, or 72 per cent., out of school and having practically no organized system of instruction in the mysteries of their art, has been the situation until within the past twenty years. The Institute school has come to carry to this vast body of our workers, and to others who ought to join their ranks, the knowledge that science has discovered relating to their calling, and the practice that experience has shown to be the most valuable for their use.

Into this vast field of agricultural education the Institute worker has entered with his limited supply of help in the hope that as time goes on, more laborers, and better equipped, may be found to assist

in the important work of disseminating scientific information and thereby increasing the productive power of agricultural people everywhere throughout the United States, in the hope that many more may be willing to aid in rendering this calling so attractive in its surroundings and profitable as a pursuit, as to become the paramount desire of every man and woman that desires to live a comfortable and independent life.

THE INSTITUTE OF RECENT ORIGIN.

I have said that this is an educational institution of quite recent origin having come into the educational field only about twenty years ago. The fact is that it has only been recognized as being entitled to a place among the educational institutions of the country within the last ten years, and even yet its lack of system and its variety in method of carrying on the work show that it still is in its formative stage, and will require years of experience and careful guidance before it will assume the full, compact, controllable and effective form which it must become before it will take its true place among the great educational organizations of modern times.

FARMERS' INSTITUTE SPECIALIST.

To aid in effecting this organization, and consolidation of work, the Congress of the United States recently created an office in the office of Experiment Stations in the Department of Agriculture, called Farmers' Institute Specialist. The purpose is to gather statistics with regard to the work of the Farmers' Institutes in the several states, and publish them for the information of the workers throughout the country; to study the problems that the Institute Director has to meet, and suggest such improvements in methods and changes in plan as will be of service in perfecting the system and aid in bringing about a common understanding as to the course that ought to be pursued in order to secure the best results.

This new office hopes to aid the Institute Directors by sending out expert scientists from the Department from time to time to give instruction along the lines of the latest discoveries of science, as they relate to agriculture, to place these Directors in communication with the Institute lecturers of the country, and to aid in educating a force of lecturers by means of literature and correspondence, and by bringing them into communication with experts who can give them instruction in their several specialties. The office can become a kind of clearing house in Institute work, and be a common center of reference for information and advice.

THE LAND GRANT COLLEGE.

In order that the place which the Farmers' Institute occupies in the system of public education may be more clearly defined, I wish to call your attention to the movement for the education of our industrial population which began in 1862 when the Congress of the United States appropriated public lands to the several states for the establishing of colleges which should teach agriculture and the mechanic arts. The statistical reports of these colleges for the year ending June 30, 1904, show that sixty-five institutions have been established from the proceeds of the sales of the public lands, and that sixty-three offer courses of instruction in agriculture. They represent an investment of about \$72,000,000 (\$72,540,588.11), and had a total income that year of over \$11,000,000 (\$11,498,341.45).

The number of persons in their faculties of agriculture and mechanic arts was 2,740. The total number of students in these institutions in all courses was 56,226, of which 15,641 were students in agriculture, or its allied courses.

There were 4,822 graduates in 1904, and up to that time almost 58,000 (57,909) had taken degrees in these colleges since their organization in 1862. Many of these students went into other occupations and professions, so that agriculture received but a comparatively small proportion of the total that the land grant colleges have graduated. Many others, however, who attended these institutions, and for various reasons were prevented from completing their college course, nevertheless were greatly benefited by their attendance, and have since gone into agriculture and pursued it with marked success.

Although some work for the education of farming people in the line of their specialty had been undertaken at earlier dates, yet it was of a fragmentary and disconnected character. The act of Congress of 1862 was practically the beginning of higher technical education in agriculture in the United States. Forty-three years have elapsed since the act passed, and yet these colleges could scarcely be said to have settled down to a well organized and clearly defined system of work until within the past twenty years.

For the first twenty years they had to struggle for existence, and during most of that period were scarcely recognized by the older institutions of learning as being worthy of the name of college, but were regarded as of a rather inferior grade of manual school. Now, however, they stand in the front rank of the educational institutions of the country, and are rapidly taking the lead in scientific progress of the older colleges and universities that not long ago regarded them with contempt.

THE AGRICULTURAL EXPERIMENT STATION.

The next great educational movement in agriculture in this country was introduced just twenty-five years after the establishment of the land grant colleges. I refer to the Agricultural Experiment Stations which were organized by act of Congress of March 2, 1887. Sixty of these institutions are now established, and almost 800 (795) persons are employed in them in the work of administration and research.

Although they have been established only eighteen years, and many of them more recently, their history and work are among the most marvelous of the achievements of this wonderful age. Discovery after discovery has marked their way until the most of that which we as agricultural people have found most valuable in our profession, has been discovered and prepared for us by the scientific men that these Stations have had in their employ. Their bulletins and reports are the most valuable contributions to agricultural science of any other publications in the world. Congress gave them each but \$15,000 per year for carrying on their work. Two or three times this amount ought to be at their disposal at once if they are to be of the greatest service, and furnish to agriculture the information which, if adequately equipped, they could easily supply.

THE NATURAL DEPARTMENT OF AGRICULTURE.

The month of July, 1862, will go down to history as marking the introduction into modern agricultural education of another force that has grown to proportions that are not equalled by any similar institution in the world. I refer to the great Department of Agriculture at Washington. In September, 1861, what is now the Department of Agriculture for the United States, was a small subordinate division in the Department of the Interior, consisting of about nine persons, and having almost no money with which to work. On the 15th of May, 1862, Congress passed an act creating a Department of Agriculture, and on July 1, 1862, the act went into effect and this new organization began its life. It has progressed and developed from a minor place among the Departments of the National Government to pre-eminence. From a Commissioner in charge and an appropriation of \$60,000 per year, to a cabinet officer with a present force of 5,134 men, of whom over 2,100 are scientists, scientific investigators and their assistants, with an appropriation in 1905 of almost seven millions of dollars (\$6,882,690) for its support.

THE WORK OF THE NATIONAL DEPARTMENT OF AGRICULTURE.

It has become the great agricultural university of America, of the world, carrying its investigations into every land, and directing its attention to every subject that promises to assist agricultural people to a better understanding of their profession, and is bringing from all lands plants, animals and methods, with the view of testing their qualities and adaptation to the soil, climate and other conditions of the United States.

Soils, plants, animals, climate, foods, roads, fertilizers, insects fungus diseases, educational problems, nutrition studies, irrigation, forestry, statistics and the editing and publishing of the results are some of the more general lines of investigation which the Department has in hand. All of these are subdivided in almost infinite detail, and are worked out in the laboratory and in the field with the most intelligent and painstaking care until the truth has been discovered, upon which the results are published and distributed freely to the world.

No agricultural people outside of this country are so highly favored, educationally, by their Government as the farmers of the United States. Colleges that are foremost in the land, Experiment Stations not equalled in the world, a National Department of Agriculture such as has just been described, comprise a system of education in agriculture of which any people may be proud.

AGRICULTURAL LITERATURE.

It has been found, however, that notwithstanding the vast amount of valuable literature which these institutions are yearly securing and sending out, and the efforts of the public press to disseminate the truths which the colleges, the stations and the Department have discovered, that the average farmer, not to speak of those who are below the average, fails to avail himself of the advantages which these publications present. In short, it has been found that farmers as a class do not read except the family Bible, the weekly markets, and, in times of great excitement, an occasional speech by the political representative of the particular party to which they themselves belong. They become physically tired after the exertion of the day, and "early to bed and early to rise" leaves little time for else but the labor of the farm.

The realization of this fact has come only within the past few years. The problem, therefore, at once arose how shall this knowledge that these institutions have gained at so much cost of both money, time and diligent research, be brought to the attention of the men who do not read, and yet who need the very teaching which this information gives.

INSTITUTE SUPPLY A NEED.

In response to this, the latest great educational movement in the interest of agriculture, the Farmers' Institute was organized, and is now sent out all over the land with its skilled teachers and trained speakers, going to the people in every hamlet, meeting them direct face to face, carrying to them the truth which they so much need. The Institute is going out as the great distributing agency of the colleges, stations and National Department of Agriculture of the United States, to disseminate far and wide the knowledge they possess. No more effective agency for the uplifting of agriculture has ever been devised. What it will do in future years, it is impossible to predict. That it will gradually come into contact with all of our people seems now to be assured, and that it will mold the character of rural life, and change the crude education which country children now receive into that of the most advanced of any in the town and city schools, are to many of us, at least two of the valuable results which these Farmers' Institutes are destined to secure.

They were organized to supply a need. They found a vacant place in our system of public education, and have undertaken to meet the want. They are engaging as teachers in this school the most capable, practical and scientific men and women that the country has, until now, as has been stated, over 950 of these teachers are regularly employed, and many thousands of others are occasionally engaged as the needs of the work in the several localities demand.

The Institute is the greatest agricultural university of the United States into which about one million of our people have already come, and under whose influence we hope to gather the almost thirty millions of other citizens that compose the agricultural population of these United States.

With this great force constantly at work, and with yearly increasing power, the outlook for agriculture in the United States is bright with hope, and all that is needed to complete our salvation as agricultural people is that we ourselves shall join hands in aiding and in encouraging these unselfish and valuable institutions, demanding that they shall have local, State and National support sufficient for their work until agricultural education in its highest and most beneficent sense has become the possession of every man, woman and child, capable of receiving it, to the remotest districts of our land.

The CHAIR: We will now be entertained with a whistling solo by Miss May Stewart Smith.

Miss Smith rendered very sweetly, "Every Morn I Bring Thee Violets," and as an encore, "The Last Rose of Summer."

The CHAIR: The next number on the program is, "Advantages to be Derived from the Centralization of Township Schools," by Prof. Samuel B. Bayle, Superintendent of Erie county public schools, Fairview, Pa.

In introducing Prof. Bayle, the Chairman stated that he had the distinguished honor of being the first man to establish the centralization of township schools, and that he now has the supervision of more schools and teachers teaching agriculture to farmers' boys and girls of his own township than anyone else.

The following is Prof. Bayle's address:

ADVANTAGES TO BE DERIVED FROM THE CENTRALIZED AND TOWNSHIP SCHOOLS.

BY PROF. SAMUEL B. BAYLE, *Superintendent of Public Schools, Erie County, Fairview, Pa.*

Mr. Chairman, Ladies and Gentlemen: In this beautiful valley of Chester, we are learning a lesson from one of the greatest farmers in our land, instructive to us as we go over that beautiful road bordering on great historic places; and then these excellent speeches to-night that reached deep into truth and unfolded it beautifully to our view. Now isn't it about time for us to quit and go to bed? In fact, I think if I were you and in your place, I would simply say, "good evening" and go; but ladies and gentlemen, as I look you in the face I come to the conclusion that I am talking nearly to the whole State of Pennsylvania, the grandest of Commonwealths, rich in her hills and her mountains, with wealth teeming forth from her valleys, with her great manufacturing interests and her immense mines of coal that extend from mountain to mountain, giving the world a chance to live. I am proud that I am a Pennsylvanian as I look out upon the blue waters of our own Lake Erie; I am proud that I am a Pennsylvanian as I look at the waters of the Delaware as they empty into old ocean; proud that I am a Pennsylvanian as I go through your Quaker city and behold its greatness, also the beautiful city of the northwest, our own Erie; proud of our public school system that gives to the boys and girls of our great Commonwealth a chance to live, that develops your sons and daughters and my sons and daughters, and makes them citizens of this old Keystone State of ours, along with the other great revolutions and developments that have aided so much in our progress, there is none that has been more important or more wonderful than the progress of our public schools.

Have you ever stopped to think of the progress of the last century? Why, ladies and gentlemen, just about a hundred years ago—you would not think it to look at my wife—just about a hundred years ago she and I rode up from Lancaster county over the hills and mountains and through the valleys with a six-horse team into the then new and crude territory of Erie county. Of course we were with our grandsires, and night before last we got on a train, took a Pullman, and waked up the next morning in the city of Philadelphia, crossed the State from end to end in a single night, hitched to the chariot of steam, while in the time of my grandfather, we made our slow progress behind a six-horse team. Such has been the grand and steady march of development in our land. So in regard to our public school system; every middle-aged man and woman will remember when we started in to school. You who are farmer boys will well remember that you started in to school somewhere after the fall work was done, and we sometimes trudged miles to the little old schoolhouse and sat on the rude benches of the time, and we opened the old arithmetic just where we had opened it the year before, marked with the thumb-marks and the dog's ears that indicated our efforts to master its lessons. We were submitted to the same tests in that old arithmetic until it sometimes seemed to us that it had neither beginning nor end. Just reflect for a moment what progress has marked the development of our system of public instruction, our common school system since those earlier days. How the gulf has been narrowed and the chasm been bridged and the difficulties smoothed away until now we have in our school system here in Pennsylvania a course of instruction and methods of which we may all well be proud.

Prof. Bayle then spoke of the necessity of divorcing the management of our schools from politics and of the necessity of keeping the power and authority over our schools in the hands of the people, and of the great benefits to be derived from the township high schools, and urged upon those present that they give their hearty support to the movement now inaugurated to provide for a course of agricultural instruction in our public schools, so that our farmers' boys and girls may be better equipped for the work of the farm, and so that their understanding and interest in agricultural affairs may be cultivated and developed to such an extent that they may not think it a hardship but rather a pleasure to remain on the farm, and to take up the work of the farmer, the greatest and noblest work in all the land.

The Professor said that one of the most important considerations of to-day's educational problem is that of centralization. He asserted that by this means our schools would be much improved; that

nearly every teacher would be able to do better work with a room full of pupils than he could possibly do when there were only half a dozen or a dozen present at roll-call. He said there was a great stimulus in numbers, and the pupils in a large school will always be able to do far better work than those in a small one.

He then took up the question of economy in school management and support, as related to the consolidation advocated. He said that the taxpayer's interest would be subserved by centralization, that the consolidated township school would prove to be far cheaper than the maintenance of two or three or more ungraded schools while the greater advantages which the children would receive through centralization would of itself be a sufficient motive to warrant the adoption of this method.

The Professor cited an instance of a dull boy, who, by patience and careful study of his mental organization and ability and temperament, had been aroused to intelligence and industry, and all because the township high school had afforded him an opportunity to study a subject which appealed to him.

He said that the advanced studies provided for in the township high school ought to be supplemented by practical and useful studies so that our daughters may learn to be good cooks, and our sons ought to be instructed along lines that would lay the foundation for their becoming good farmers, as well as generally intelligent men and women.

The Professor paid a high tribute to the women of Pennsylvania and expressed his regret that more of them are not represented on the school boards of the various counties.

The Professor advocated the provision in all the primary grades not only for concentration and strengthening all along the line, but also the introduction of nature study, and instruction particularly with reference to flowers and birds. He said in the next four years let us go a little further in this direction and give our pupils more insight into the mysteries of nature, and also give them more time to apply to the great subject of agriculture. Let us have the strength of the old district school and the proposed new methods combined, the one side by side with the other where the rich and the poor will have the same opportunities and be brought together under conditions fitted to develop them into noble and intelligent men and women. Do not neglect to instruct them in the history of the old flag. Let them look down upon the grave of Benjamin Franklin; teach them the history of Pennsylvania and the story of its great men; teach them to rejoice in the liberty that we enjoy; let them look upon old Independence Hall, and weave into their minds a knowledge of the glories of our great Keystone State.

Let us stand by these schools. Let us build them up and strengthen them and support them, so that the future of our great Commonwealth will be even greater than the past, and greater than the present.

Adjourned until to-morrow morning at 9 o'clock.

Memorial Hall, West Chester, Pa.,
Thursday, 9 A. M., May 25, 1905.

Watson T. Davis, of Ivyland, Pa., in the Chair.

The meeting was called to order at 9 o'clock.

The CHAIR: The first number on the program is "Methods of Institute Work," by Prof. M. S. McDowell, State College.

Prof. McDowell's paper is as follows:

METHODS OF INSTITUTE WORK.

BY PROF. M. S. McDOWELL, *State College, Pa.*

It is with diffidence that I approach the subject which has been assigned me by the Director of Farmers' Institutes. The discussion of this question may seemingly place me in the position of a critic, but such an attitude I do not wish to be understood as assuming. I fully appreciate the difficulties which confront the institute worker in the presentation of his subject matter and I also appreciate the fact that "Those who live in glass houses should not throw stones." What may be said is not in any manner to be construed as criticism of any individual engaged in institute work. I shall endeavor, in the few minutes at our disposal, to speak of a few things which have appealed to me as a result of seven or eight seasons' experience and observation in farmers' institute work.

We have passed the day when it was believed that farming did not require special preparation and a high degree of intelligence and that no scientific problems were involved.

The great industries of the country have passed or are passing through a transformation and their operations are or are coming to be based largely upon a knowledge of the scientific principles underlying. This does not mean that the men who operate the great mills and factories are scientists but it does mean that they are taking advantage of the practical application of the developments of the scientist. In this connection we should be careful

to make the distinction between a science and an art. This is desirable because of the tendency to confuse these two things and because agriculture should be dealt with as an art and not as a science. A science deals only with the relations of cause and effect within its own field. Its sole single concern is to trace effects back to their causes; to project causes forward to their effects. An art, on the other hand, starts with the assumption that a certain thing is desirable or that a certain other thing is undesirable; that something is good or that something is an evil. The object it seeks is to ascertain how the good may be attained, or the evil avoided.

In pursuing this inquiry, it makes use of the principles, or laws, governing the relations of cause and effect, which have been ascertained in the cultivation of all the sciences that have in anyway to do with its own subject matter.

Agriculture then is an art and, as in the practice of any art, we seek to apply the largest and latest results of the various sciences, as chemistry, bacteriology, botany, etc.

In our institute work it seems to me desirable that in presenting many topics the principle involved be emphasized as far as possible and that we, in addition to outlining methods, endeavor to impress the fact that a proper understanding of the principles is more likely to bring success than an attempt to follow the course as may have been mapped out during the discussion. It is often necessary to reach the principle through the use of detailed method in order to make it stand out clear. To illustrate, we all will agree, I think, that the presence of humus or vegetable matter is one of the most important factors in restoring a so-called worn out soil. We may be told that the clovers, cowpeas, etc., are the best things that can be grown for this purpose, all of which may be quite true. But in some cases the absence of the very thing we are after may be the cause of the inability of clover to grow. It may be desirable, therefore, to use some other plant for a time at least. In other words, it may be necessary to use different crops in different cases, but yet the principle involved is the same, i. e., that the presence of humus is necessary. Emphasize the principle and then suggest as to method.

A fact which is often true and yet not always apparent is, that often we emphasize a particular thing independently of correlated facts and as a result some one may be led into an error which, while we may not be directly, yet we are indirectly responsible for. It is proper and necessary that in discussing a topic we stick as closely as possible to the text and impress the particular points connected with our subject; but in that very fact lies the danger. There are doubtless other conditions which are as important and

necessary as the one we are trying to emphasize. Many auditors not realizing this fact may assume that the one thing which they need to bring them out of their troubles and place them on the easy road to success is the condition upon which the speaker has dwelt and that this condition or effect may be secured by methods which have been outlined by him.

To illustrate: Fruit growing is necessary and as we advance, new pests appear and multiply rapidly. It is necessary to recognize this fact, and spraying has been resorted to as a means of controlling the condition which prevent the ravages of many of these things. A knowledge of how to spray intelligently is a necessity in orcharding. It is something that needs to be taught. When the subject of spraying is under consideration it is desirable to confine attention to this one thing. Now there are perhaps many people whose orchards are unproductive. The suggestion of spraying is new to them. They grasp it as the means of securing productiveness and fail, not because spraying is ineffective, but because they failed to appreciate that proper fertilization, cultivation, pruning, selection of stock, etc., are all matters of primary importance. All these things must work together to bring about the desired result and satisfactory results from spraying can not be expected unless the other conditions are what they should be. It is sometimes well to make these facts clear. In this same connection extravagant statement is to be avoided. While enthusiasm may lead us to speak in glowing terms of certain things, great care should be exercised that our enthusiasm be not allowed to outrun the truth. Too extravagant statement is likely to weaken whatever of truth and helpfulness may have been contained in our discussion. Another matter which it seems well to bear in mind is that we cannot be too careful in our statements. We cannot make them too plain; but the reverse may easily occur. Discussion over a particular point in an institute is very often due to a misunderstanding of the positions assumed by the opponents. Much of the trouble which occurs in this world is due to misunderstandings and it is well to avoid them in the institute. Very often an apparent difference of opinion has no foundation in fact, but is due to the different view point from which individuals regard the facts. It is well for the reputation of the institutes themselves, for the good of the particular institute and in justice to the speaker himself, that he get as far as possible the point of view of those who may differ from him. By so doing it may often be possible to bring out the cause of failures in certain directions.

At a certain institute, the question was asked as to a remedy for San José Scale. There did not happen to be any one present who discussed fruit and the various phases of fruit growing, but one of the members of the institute force answered the question by say-

ing: "That while he was not engaged in fruit growing and made no pretense in discussing a question of that character, he had heard practical fruit growers discuss it and had read somewhat of the experiments that had been made in this particular field, and the consensus of opinion with these people was that the proper use of the lime, sulphur and salt wash was the most practical method of combating this pest."

Immediately some one in the audience arose and made the statement that lime, sulphur and salt was absolutely without effect and that the only thing to do was to cut the trees down and burn them—a pretty expensive and discouraging course to pursue. The question immediately drifted into a discussion or rather statements pro and con and the effect that "So and So has used it and it will do the work," and on the other hand, "I know from my own experience it will not."

Those who are using the lime, sulphur and salt spray take pains in its preparation, use the best possible means of applying the spray and use it at a time and on trees where it has a fair chance to accomplish results. According to my understanding, if it is improperly made, improperly applied or used on trees which have become so effected that they are already practically dead, satisfactory results can not be expected.

The physician is very often able, through proper treatment, to save the lives of those who are dangerously ill, but beyond a certain point the physician can not go. If his remedies are carelessly and improperly prepared and administered or applied in the same way, little can be accomplished, nor can the physician revive one already dead or dying. The same principle applies with equal force to the vegetable kingdom. If all these things can be made plain it may enable those who have failed to see why they have done so. It is by bringing out these facts that the institute can accomplish the greatest amount of good. It is desirable to avoid misleading statements. There is probably no one subject upon which there is a greater divergence of opinion than upon the question of lime. We know too that those who advocate either the one side or the other of this question are perfectly sincere and probably right for their own conditions. A statement to the effect that "lime is good to whitewash with," does not necessarily mean that those of us who make that statement intend to imply that we do not believe in the use of lime in some cases but we mean that in our particular case it is not needed. However, such a statement without further explanation would give the impression that the individual working it did not believe in liming at all and were he to go into some other part of the State where the use of lime was proving beneficial and helpful and make such a statement, his usefulness would be materially weakened.

Again we know that color is not in itself an indication of fertility, and colored water running from the barnyard may contain but little fertility—which statement we sometimes make—but yet is it not wise to impress the fact that while color does not necessarily signify fertility, if colored water is sweeping from the barnyard or from any place in proximity to manure, it is safer to assume that it may contain it and thus avoid the appearance of evil. Wrong impressions are often left as a result of failure to appreciate some of these details.

Conservatism, especially with reference to some of the more recent developments in the field of agriculture, is desirable. While much that might be said may be based upon actual fact, yet statements are likely to be made upon insufficient evidence, the practical details have not been sufficiently worked out or too strong statements with reference to some of these matters may mislead those who are not entirely familiar with the facts. Experiments conducted by the United States Department of Agriculture in Florida, by the Experiment Station in Conn., and by the Lancaster County Tobacco Growers' Association, in conjunction with our own Experiment Station, have shown that Sumatra wrapper leaf of fine quality may be grown under canvas, and if this can be done successfully it will prove to be of great advantage to our tobacco growers. While these experiments have in some cases proven quite successful as a whole, the results are not sufficiently comprehensive to make it possible to safely advise anyone to attempt the growing of tobacco in this way commercially. Therefore at the present time even though it has been done—it is well to take conservative ground and await further developments rather than attempt to advise its use.

Again, much has been said recently about soil inoculation. We believe in bacteria and in soil inoculation, but too broad statements may lead many to believe that inoculation is all they require to grow large crops of clover and other legumes and they may waste considerable cash in learning that inoculation is not the only condition required and that even where it may be needed, can not be done successfully unless the other conditions are what they should be.

And, finally, the institute man is supposed upon all occasions and under all circumstances, to preserve his equanimity and support with dignity his position.

The CHAIRMAN: The subject is now open for discussion.

MR. NORTHUP: Mr. Chairman, I am sometimes troubled with a gift of continuance, but I am going to talk just five minutes now, and then stop. I want to talk about the county chairman, with the exception of Lackawanna county. I won't say anything about that, but I believe they are the best class of men that you can get any-

where in the State of Pennsylvania in our pursuits. They understand their business and you can't help loving every one of them. I do not believe there is any mistake made in Pennsylvania in regard to these chairmen, but I believe a chairman sometimes makes a mistake when he puts in a substitute. Some of them have so much business, you know, they have to go away, and then they put in another fellow to manage the institute. I have thought sometimes that he was put in because he was the best friend they had in the world, and did not seem to be adapted at all to the situation.

I have seen a fellow get in the presiding officer's chair who did not take very much responsibility upon himself. He was merely there to have a good time. He announced that the first speaker would occupy the floor and then he laid down the program as indifferently as if he was going to sleep. He didn't seem to think he had anything to do until the next fellow came upon the floor. Then he takes up the program and has to get out his spectacles and wipe them off and then has to look to see who the fellow is and then he reads it off in just such a way that the speaker feels as if he had never had such a send-off in all his life before, and wishes that he was never an Institute speaker in the world. There is another thing about it; they introduce these fellows and tell who they are. I have seen a gentleman stand on a platform and introduce a speaker when you couldn't tell ten feet away what he said and when the speaker got up he had to introduce himself over again. It seems to me that is a mistake, and that when a man is substituted he wants to be as good or better than the chairman himself, and the Institute runs all right.

I have got a little something to say about the speaker—I am not talking about the speaker from Lackawanna county. Some speakers are afflicted with what I call the gift of continuance, and there are some who get wonderfully careless, who begin to talk in a monotonous tone and who forget that it is their business to interest the people until some way or other they get hypnotized and put to sleep. You know there has got to be something to arouse that interest or it will die right there. I believe the best way is to have some music, and I have seen the chairman when such a fellow as that was talking step down to the choir and say, "Now if you have got any soul-stirring music, give it to the audience when this fellow stops," and that will revive it, and put new life into it. You can't succeed in farmers' institute work when people are sleeping.

At a political meeting in Lackawanna county, a Republican party meeting, a very prominent Democrat had a lot to say, and the problem was, how to get rid of him. He was a member of the Legislature. He talked and talked and there was a certain member of the audience who fell asleep, and just in the midst of the meeting

he awoke in a rather dazed condition, and said, "Gentlemen, what appears to be the excitement?" We want these fellows in the farmers' institute that can wake up men.

Now as to the topics to be presented. We want all these practical topics on our program to-day presented. We can't get along without the dairy, potato growing, and the fertility of the soil and all those topics; we want the educational topics; they must come in. I wish it was so right in this body, that there would be a dairyman, a fruit man, a potato grower, and all these interests represented and then we shall have good work.

When you get two or three talking on the same topic, there will be a conflict. What we want is to get at the truth; get at facts through the experience of others.

The CHAIRMAN: I will call the roll so that all may have an opportunity to speak.

Several counties were called and the members either declined to speak or were not present, until Blair county was reached, when Mr. H. L. Harvey, of Kipple, responded as follows:

MR. HARVEY: Mr. President and Fellow-Farmers: Perhaps there is more of somebody else than there are of farmers. I am not accustomed to speaking in public, but this seems to be one of the important questions. If there is anything I dislike to talk about before the people, it is something I am trying to do myself. I have been endeavoring to fill this position for some years and I have enjoyed the work. It is a glorious work to educate the farmers, as they have the highest calling in the world, and our labors have been harmonious and pleasant. Our masters which we recognize, is the present man that fills the position of an Institute Director in the State. He has made a success of his appointment. We look to him as a good director. He has helped us when we have called upon him to help us and I am glad to say that he has got along very well. In many respects the position is an important one, and to accomplish the best results, it seems to be the hardest thing I have ever undertaken.

I may talk a little over five minutes; if I do, why call me down. I didn't take my watch out, but I want to say that to get the farmers to meet is the point I want to reach if possible. How shall we do it? There are a class of people in Central Pennsylvania in a number of counties that think they know enough about farming; they tell me so. They say, all we want is the land; when they are as ignorant as boys in reference to the great subject that they are trying to follow. It seems to me that we ought to get something to stir those people from the present position that they occupy, an unfortunate position, to be satisfied with what they know. We are

always young enough to learn, and ought to be always trying to learn, and I would like to have a subject suggested by somebody that would show to the people the difference between intelligent farming, and ignorant or uneducated farming. If they would see the difference, it seems to me they would be aroused and be willing to learn. At present they are asleep.

The Apostle Paul, in one of his discourses, told men to awake out of their sleep and arise from the dead. When you come to talk to the farmers, a light comes from Harrisburg and from the State College, so that anybody who desires to have a farmer's education can get it.

These things are very important. That is one subject that I hope somebody will frame up so it will not be a question but cause them to know that they don't know enough, don't know anything, scarcely, and that they will try to get the education that they can get by making an effort.

There are other subjects. One question we want to mention, is to keep before the people the problem of public roads. We have the worst public roads perhaps of any other state in the Union; I mean of the older states. Then another question is the high school, or the concentration of the township schools. We want that kept before the people because it is important. Then we want a better class of live-stock; more thoroughbred stock we need in our State, and especially in Blair county where I am well acquainted. We need all these things. A more thorough cultivation of the soil is very important. I am satisfied that the soil is not as well cultivated up in Blair county as it is in this county of Chester, judging from what I have seen in looking over the farms here as I have passed along the public road during these two days.

I did not expect to make a long talk; I didn't intend to talk at all unless I was called out. I am not accustomed to public speaking, but I desired to say these few things. I am much pleased with our meeting. It has been grand ever since we have been here together. I consider these the best meetings we have during the year, these round-up meetings. The Agricultural Department of Pennsylvania is doing the very best of work, and the State College, just look what it is doing; look at the work that comes out from there, and the Grange; look what that is doing. The distribution of literature is wonderful at this age, and there is nobody doing any better than our agricultural department; nobody is doing any better than the College in that line, and the opportunity for the chairmen to do good work is to receive these publications and spread them among the people.

MR. DIEHL, Bedford County: Mr. Chairman, Mr. Harvey has about expressed by views on that subject; therefore I will not say anything.

MR. CHUBBUCK, Bradford County: Mr. Chairman, it is with a great deal of embarrassment that I rise to say anything. I am wholly unprepared, but I have jotted down a little bit here. I am very new in this business, being only one year old in taking charge of Institutes and being from a county of such size that my chief trouble has been to locate institutes throughout the county that were near enough together so that I did not have to take gentlemen who are on a strain through the whole winter, over too much territory. The county which I represent has about 7,000 farms, and across it from east to west and north to south is nearly thirty miles. My brother here says it is more than thirty. It is a long distance, anyway, and in order to satisfy people, it seems to be necessary to put at least two institutes at each side of the county, dividing them into east and west. As far as the attendance is concerned, we have found that the attendance as a rule is only limited by the size of the room. I think that the lecturers that were with us last year will agree that that is so, no matter what the size of the room was, we always had it filled. The attendance being so good, we have not had to look after that.

Now the people throughout the county, I think, are taking every advantage of this institute work. I have had application after application asking about these cultures from gentlemen who wanted to know about inoculated soil; and I also know of a great many Babcock testers that have been bought in my county since this subject was brought into importance.

We have one special educational session and our county superintendent gets around to all our institutes and attends to this one. We make a point of having an educational session that is right up to date. We have an educational county that is among the very first in the State, and we are following up the consolidation of schools. We have that brought up in our institutes and our people are taking a great deal of interest in the subject.

The CHAIRMAN: I have a few words that I would like to say to the lecturers. I think it would help the county chairman out to prepare a syllabus—if each lecturer would prepare a syllabus of his lecture and send around before he goes into the institute to present it, and I would also suggest that when men are sent out, and for any reason, are not able to come, that they let us know in time so that we may procure a substitute. We had a little trouble with that this last winter. There were two men sent to our county—it is a dairy county, and they were neither one present when the in-

stitute convened. One man didn't send word until the day after he was to be there. When the lecturer cannot come, I think he should notify the directors of the institute so that a substitute may be provided. We had men that drove fifteen miles last winter to hear the talk on dairy subjects and there was nobody there to talk to them. I would also suggest that where the districts adjoin, institutes should not be held at the same time.

MR. RIDDLE, Butler County: Mr. Chairman, I have never had any difficulty in having an interest in institutes and I think I have had with me almost all the leading lecturers, and our institutes have always been a success.

One thing, however, that I want to talk about is this: That sometimes institute workers make extravagant statements. A number of years ago, with a party to whom I am about to refer—he is not now on the institute force—but a number of years ago he was in our county as a member of the institute working force, and he made such extravagant statements, that I deemed it my duty as chairman, to call his attention to the fact. One of the statements he made was that he had a cow which produced three pounds of butter a day. After he made that statement, I called his attention to it. I said, "You ought to be a little guarded in your statements; that statement is misleading. It may be true but it is pretty hard to swallow any such statement." I want to say further that that gentleman had a chart that he used in his illustrations, and after he had gone through our county, while sitting before him one day, I said to him, "Have you noticed that there are two words in your chart which are misspelled?" No, he hadn't noticed that. These misstatements leave an undesirable impression, and create a feeling that the rest of the matter being given may also be unreliable. You know, Mr. Chairman, that the royal road to success has never been discovered, and I want to say this, that one of the most important things that a lecturer before an institute can keep in mind, one of the best impressions he can make and one of the surest impressions that he ought to leave, is the fact that there is no excellence without great labor; that is as true to-day as it was when we read it in our Fourth Reader when we were boys at school. It is a truth from which no power of genius can absolve us. If that impression is left, the institute work will be more successful.

Last winter a new force was sent to our county, and when our institutes had been located and announced, a number of men came to me and said, "Why do you have a new force this winter?" I said, "I have nothing at all to do with it." I said I knew the gentlemen but I didn't know how effective they were as institute workers. After they came into the county and held their institutes, these men came to me, many of them, in fact a great majority of them, and were

better pleased than ever; as well pleased as if they had had the selection of the speakers themselves.

Now, Mr. Chairman, I want to say that if the institute workers of this State want to make institutes a success, if they want to make the Department of Agriculture of our State the success that it ought to be made, they must each and all be loyal to the administration of the Department of Agriculture, and if they are, I know the work that is being done will be successful and that the Department of Agriculture will be even a greater success than it has been in the past or is at the present.

MR. HALL: Mr. Chairman, for the benefit of those of us who have to twist our necks around, will you ask the speakers to kindly take the front.

DEPUTY SECRETARY MARTIN: Gentlemen, you all have difficulties in your work. Now I would like to suggest that you make that a prominent feature of your discussion. We want to hear about that, and profit by one another's experience.

MR. HOWARD, Cameron County: Mr. Chairman, for the last five years I have been the County Chairman in our county. Just why they put me on, I don't know. Of course I had a farm, but I am no farmer. I am, as Brother Herr says, an "agriculturist," but we have been holding institutes in our county for a number of years, and at first they were well attended, but for some reason or other they run down, and I guess they put me on because they couldn't get anybody else that would take them. The first two years I was very much discouraged. We probably would open up the meetings with six or eight, or ten or fifteen farmers, an audience of from twenty to twenty-five was about the average, and one or two instances there were only about half a dozen, and in the evenings there would be probably fifty or a hundred, something like that.

It has been said that the National government was doing a great work for the farmers in sending out their publications, and it was also stated last night that the farmers are not much for reading, and I think the assertion is borne out that these pamphlets and circulars and year books, etc.—that are sent out—that probably not more than five or ten per cent. are read. They are well worth reading, but if the farmers don't read them, what good are they? What is the use of all that expense when it does not produce the result? And there is where the farmers' institutes come in. If the farmers won't read, why, hold your institutes and drill it into them; talk it into them. They will sit and listen to you and hear you talk, but they won't take a book and sit down and read it. Hence, I say, the farmers' institutes are doing good work. Tell them about these

things in your farmers' institutes, but if you can't get the farmers there, then you are not getting the real benefit you ought. How shall we get them there? What shall we do to induce them to attend? That is the question, and as I said before, at first I was very much discouraged when I found that the farmers in my county were not inclined to take advantage of these farmers' institutes, and these lecturers that are being provided; in fact, when I would inquire of the farmers why they didn't come to the meeting, they would say to me in reply: "What do they know about farming, anyhow? They never got behind a plow and plowed; all this book learning is well enough on paper and well enough to tell about." So, as I said I was very much discouraged. I didn't want to stand up there and spend all this money and time and have only a few come out.

Now you can't always drive a horse or any other animal to water and make him drink, but sometimes you can coax him, a little coaxing, a little tact will bring him around, so I thought I would introduce something like that. I have been sending out these circulars to the farmers, as well as the postal cards. The last week before the meeting, I would write to every farmer three letters during that week, three postal cards or letters, and ask each one to come, and it occurred to me in my effort to increase the attendance, that I would do a little coaxing and devise some new method to interest them, so I hit upon a plan and I offered prizes of a barrel of flour, a half a barrel of flour, a ham and a pig for each day, what I called an attendance prize. Now, you know, some people who can get something for nothing, they will always be on hand, and if there is a little lottery connected with it, you will find them all flocking there. If there is a raffle in town, they will go down to the raffle, because there is a chance there of getting something for nothing. We didn't even charge for admission. We simply offered these prizes. Every person entering the hall or the room—we held our meetings in the Court House—was given a ticket with a number on it. If he came in the morning he got a ticket; if he came in the afternoon he got a ticket, and if he came in the evening he got one. If he was there the whole three sessions of the day, he got three tickets. At the end of the session, in the evening, after all was through, I put a lot of slips in a cigar box according to the number of tickets given out during the day. If there were fifty tickets given out to-day, we put in fifty slips in the cigar box. If there were seventy-five given out, we put in seventy-five. If there were a hundred and fifty given out, we put a hundred and fifty in the box, etc. We shook all these tickets up, and then we had the drawing, and the first ticket that came out got the barrel of flour. Whoever had that ticket got that prize. The second ticket that came out got the half-barrel of flour. The holder of the third ticket got the ham, and the holder of the

fourth ticket got the pig. The first year, although I advertised it, while there was quite an increase in the attendance, I presume that a great many of them came out of curiosity, to see whether I would fulfill my promise. Whenever we say we will do anything in our county, it has to be done, no matter what it costs it has to be done. I intended to have all these prizes right there at the time. I had the flour on the table in the sacks. I had the ham also lying there, but the pig I was unable to get. In sending out my requests to come to the meeting, I asked every one to tell me where I could get a pig, but as we hold our meetings in January and February, it is rather difficult to get shoats up there. One party sent me a little China pig, so I had the china pig lying on the judge's desk, but as I couldn't give them a pig, I gave them what I considered the equivalent of the pig, a two-dollar bill.

I gave these tickets to everybody, man, woman and child. I didn't care who they were, because these things interest them or should interest them all. I consider they are as largely for the child as they are for the farmer or older person. I believe the child is more entitled to them, if anything. You can talk to these old heads and they have got their set views and they will not listen to you, but the boys, the younger persons who have not got set in their ways, they will drink it in, and some day it will produce good results in the boys, and that is another reason why farming, I believe, should be taught in our public schools. Take these young people that are growing up, the beginners even, and talk to them about bugs and flowers, etc., how they grow. Teach them these things and they will keep on progressing.

The next year we had some very good meetings and last year I had the largest of the three, and I want to tell you, this last year, instead of having a few seats in front, the same as this audience is now, we had every seat in the room filled, and we had to bring in chairs and filled up the hall.

MR. McCLELLAN, Clarion County: Mr. Chairman, I have not very much to say in regard to this subject, in fact I am not very much of a talker. We have a pretty good attendance in our institutes, and the people take a pretty good interest in them. The worst thing is, to get a place to hold them. We generally have to hold them in the churches, and we have some among us who are not in favor of holding the institutes in the churches. Some who have a little bit of religion in the back-bone instead of the heart, rather object to it. I am not like my friend in Bradford in regard to locating my institutes. We have got between 34,000 and 35,000 inhabitants in my county and I try to locate them in such away as to reach the greatest number of people interested in them. I try to provide a way to get the State speakers transported from one

place to the other, and any one that cannot stand the transportation, we will try to send him to the hospital for a few days. I didn't know how it would be with Brother Lighty last winter but he got through all right, for I see he is able to be here. On one occasion we had nineteen miles to drive through snow-drifts, and in some places had to shovel out the horses and in another place had to drive eighteen miles through snow-drifts to attend the institute, and the next place was eighteen miles further. That is the way our institutes are located. We have full houses, and the people are interested in them. There are, as Brother Howard says, some old foggy farmers that we can't change. We must get to the young people; get them interested; that is where we will receive our benefit. I would like to be favored with speakers of a diversified class of farming, and not strictly one kind. We change our programs. When I make up a program, I go to the place where I am about to hold an institute and appoint my local committeemen and send their names in to Director Martin and set a time to go to that place for holding the institute and help make up the program, with the understanding that when the speakers come there, they can change these programs.

We always have an educational session. We are able to get the county superintendent to attend one institute. We have had some very good instructors there last winter. I have no complaint to make of my people in regard to attending the institutes. We have very good attendance and good attention.

MR. NELSON, Clearfield County: Mr. Chairman, I havn't had the trouble in Clearfield that some have spoken of. We had to get a policeman last winter to keep them from tearing the hall down. I think the Deputy Secretary will testify to that. The attendance at the local institute in March of this year was very good, notwithstanding the fact that it rained before the institute began, and continued until after it was over, and the roads were almost impassable. There has been so much interest shown on the part of the people in institute work that we re-organized our agricultural society during the past winter and appointed twelve vice presidents and divided the county into twelve districts, and we expect to hold twelve institutes; that will relieve me in carrying on the work. We do not have to give any prizes there to get the people to come out. I think we ought to send a missionary over into Cameron county, from what friend Howard says about his experience there.

A Member: You have no agricultural fair in your county?

MR. NELSON: No, not now; there was so much horse-racing and gambling that the people were against it. It is not necessary to have the fair to get the hundred dollars appropriation.

Gentlemen, the county institute manager should have some qualifications of his own. He should be an enthusiastic institute worker himself to begin with. He should be able to take care of his institute, always appointing a live, local committee, fixing the time when the institute is to be held and going there to help them prepare a program, then before the institute opens he should go and see that all the preparations have been properly made. We have trouble in getting halls large enough. There are no halls in our county sufficiently large in which to hold our farmers' institutes without we use a church, and so many of our institute speakers think that the farmers need to be entertained by telling funny stories that they sometimes trample on people's toes, and we have been deprived of the use of one or two of the churches on that account. If you get audiences enthusiastic and heartily interested, it is not necessary to tell them stories to keep them quiet.

Second, he should have ability; he should be a good parliamentarian; he should always have complete control of his institutes, not only of the people who attend, but of the speakers as well, and to do that he must keep his institute running. I made a mistake at one time and Colonel Woodward corrected me for it. I once appointed a local politician to preside, and he always took a long time telling that certain people not in attendance were not present. One thing must be kept in mind. Whenever you give people the time to commence to talk and whisper, you lose control of your audience, and I make it a point to insist that there shall not be any of that done. I know that it annoys the speakers and it also annoys the chairman. Extravagant and unexplained statements are the chief causes of arguments against our institute work. The chairman, while being very careful, should be able to lead and not drive, and see that these things are not done.

We used to have through our county, occasionally, some people who were so enthusiastic about liming land that they were full of it. It makes a good deal of difference whether you make the money yourself or carry it. They would say it would pay to put three, four and five hundred bushels of lime on an acre. Those people could talk to you very learnedly about dairying. The only two worthless cows I ever bought in my life were from institute workers who could make a good speech at an institute and tell you all about cows.

The Chairman also must have tact in managing his audience and speakers, and prompting them when necessary. I have had institute speakers sent to me who would get up cornerwise to the audience, probably with one foot on a chair-rung, perhaps with their backs turned to the audience, and who would talk in such a way that one would not be able to tell one-third of what he really did know. I always think that such speakers should take a course of

instruction and practice a little before they go out into institute work in the country.

MR. HERR, Clinton County: Mr. Chairman, I am glad that Mr. Nelson made his speech; it relieved me from part of mine. I won't undertake to tell my experience in holding institutes in Clinton county, and the few remarks I make will be in the line of Mr. Nelson's talk on the duties of county chairmen. I think that is really more what we want to know; our experience. The county chairman must be a man of prominence and have the respect and esteem of the community in his county. If he hasn't that, the sooner he is out of the business, the better; get some one who has it. He must have some executive ability. He must have some knowledge of institute work. We cannot expect everybody to have that. There are newcomers who have never had that experience and knowledge, but he ought to know who his speakers are, and be able to introduce them so as to tell the audience who they are, and what they may reasonably expect from them, and as to their reliability, whether they are actual workers on the farm, and whether they have had actual experience. It is well enough to be courteous, but you can pile it on too thick and embarrass the speaker, when you lose the respect of the audience. I do not believe in being too complimentary to the speaker. There is such a thing as overdoing that. There are some people who are like myself, a little light-headed, so they will readily, if you compliment them a little too much, think they have got so much valuable information and are so highly appreciated by the audience, that they do not give their audience the credit of knowing a little more than they do.

Now a county chairman ought to be an organizer; he ought to have his heart in his work; ought to be willing to work a great deal in preparing for the work in his institutes; ought to be willing to sacrifice of his own means and his time and have his heart in the work. He must know the people; know his county and know how to make arrangements to get the speakers from one part to the other in the best possible manner, know how to make them comfortable and feel at home, and provide a proper place for their accommodation. He must know the people well enough to have the confidence of the people, so as to be able to secure proper accommodations for the speakers. He must know how to advertise; he has got to have the confidence of the press with him. If he has that they will print anything he asks of them free of charge.

He must be able to use the funds of the Department economically and wisely, and he must be able to show to the people just what he does with the funds. A great many institute managers are suspected of doing something with the funds not allowable. People think there is some money in it. What he does with the funds

ought at all times to be brought out and made known to the public. Let everybody know just what it costs; what he gets and where the money goes.

MR. OLIVER, Crawford County: Mr. Chairman, we try to make the institutes in Crawford county practical. One of the first things that I do is to call my committee together at the county-seat, for I think that is the proper place. I try to invest them with at least as much enthusiasm as I have. I try to make them think that the success of the institute depends as much upon their activity and the effort they put forth, as it does upon my own. We try to make the institute practical from the beginning to the end; and I may say that our rooms in which our institutes are held, sometimes in a church and sometimes in a hall, are filled and often more than filled. Of course some of our institutes are better than others.

I think that the chairman should get in touch with the people so as to know what are the things they most desire to have discussed at the institute. The housewife, if she has company, and only knows the dishes her company most delight in, can easily prepare a feast for them; so I think if the committee, an active committee, comes so close in touch with the people there as to know what are the subjects in which they are interested, they will know how to prepare an interesting program and know what subjects should be discussed.

REV. T. J. FERGUSON, Cumberland County: Mr. Chairman, I have just a word to justify my presence here as a county manager. There were two things yesterday that made me feel very comfortable, sitting among you as a manager of farmers' institutes. One was the splendid address we had last night on the importance of farmers' institutes in public education, touching the lives of the whole rural community, and as a minister I have always been interested in more things than simply the affairs of my congregation. I have been interested in good schools, good roads, good health, and everything that touches the rural communities has been an object of my interest, and that is one of the things that made me feel very comfortable among you. The other was in connection with that splendid entertainment that Mr. Kates gave us yesterday.

It was a matter of great interest to me to see this body of institute managers and lecturers sitting at the feet, or standing at the feet of a brother minister, learning the lessons of soil fertilization. We heard in the morning that the chemist, a very high authority, could tell us absolutely nothing about available and unavailable plant food, and so Mr. Kates took us back to the country and in that delightful ride and entertainment, gave us an object lesson, and so we sat at the feet of a brother minister and learned about soil fertility; therefore I feel that I am justified in being here.

I do not preside at our meetings; I try to see that there is somebody to preside who can do it. I do not pick out the local politician, or some member that is not capable of doing it. I believe that the institute ought to be a source of education and development for the farmer, and there is nothing that will develop a man like making him the presiding officer at some meeting, and it gets the whole farming element in touch with him and gives him an up-lift.

My brother from Cameron county has given us an original idea. He spoke about holding their meetings in the Court House. I may say that when I became manager of institutes, they were held in the larger towns, two larger towns of Cumberland county, and I think that we would have had to have the ham and the pig to keep up the interest there. When I became manager, I took the meetings out into the country and we have no trouble about getting full houses, and the people we get together are practical farmers. I have lived in the community in which I am now for more than a quarter of a century. I know the county and the people. I am able to select men to compose the local committees that will be interested in the institute work.

A wise minister will not do anything himself that he can get anybody else to do, and I believe that is the wise principle in the management of our local affairs. If we can get good local committees, everything will move on in good shape. We have our little experiences. One man put in a bill for \$5.50 for the posters sent out by the Department. Well, he was without the job the next year. I wish that we could have more institutes. What are two institutes, four days institutes, in the great county of Cumberland in educating and lifting them up in connection with this great work. I wish we could have more institutes for the farming element, and if we would stand together for our own interests, knowing what we want, I tell you, friends, that the men who manage things would come and ask us what we want, instead of saying that we can count upon these men to go with us under all circumstances.

Mr. Kates, being present, was called on by the Chairman.

MR. KATES: Mr. Chairman, it is with a feeling of much timidity that I respond to the suggestion that I say a few words. Unfortunately, I don't know enough about agriculture to give you any of my experience. I don't have to know anything about agriculture; Mr. Detrich knows it all. But there was one word used here about twenty minutes ago which turned my thoughts to something which I am somewhat familiar with, which might be used in your institutes. It is, therefore, a sort of a question I am stating. The point that occurred to me was, that when you state that in your institutes it would be advisable to have a syllabus prepared and sent out

sometime before the institute would be held, that the traveling libraries might be used in conjunction with your institutes. If you have a syllabus, it would be necessary, I suppose, to have some books to aid one beyond the syllabus, so that one would be better prepared to recognize what the instructor was saying. The State, as you know, supplies the traveling libraries, and I believe they have received a rather larger apportionment of the State's money this year than ever before. My very dear friend, the Hon. Mr. Montgomery, is the State Librarian, and I know that he would do anything in his power to bring his Department into touch with the farmers' interests. Mr. Montgomery has always had a great love for farming, and his farm I think most of you passed yesterday on the way over to my farm. These books are obtainable in sets of either twenty-five or fifty, and suppose, for instance, that one of the topics of discussion should be corn and the syllabus would explain the different points that would be brought up; by having one or two books in this traveling library on corn, it would be a help to the locality. The books could remain from one month to six months. I merely present this matter to you for your consideration, as I thought this to be the educational section of your institute.

A Member: What are the conditions necessary in order to get the books?

MR. KATES: A formal application is made to the State Librarian who is a member of the traveling library commission, and afterwards there is a very simple form to be filled out, one or two persons becoming responsible for this library. It is absolutely a mere matter of form. The books always come back, and almost always in very good condition. The cost is that of transportation only. The idea of the traveling library is, that after a community becomes accustomed to having these fresh, new, nice looking books with them from time to time, it stirs up an interest, and this traveling library soon grows into a stationary library. The books, of course, would be chosen by the institute lecturers and by Mr. Martin, and I know that his aptitude for taking up everything in the line of agriculture in the State, would assure a good selection, and I know he would find Mr. Montgomery a very congenial individual to work with.

The DEPUTY SECRETARY: I might add, in a supplementary way, that I have found the present librarian, Mr. Montgomery, a very friendly ally in the way of procuring and distributing literature of a high standard, such literature as is well adapted to the needs and wants of the farming communities of Pennsylvania; and since it has cropped out here on one or two occasions that we farmers are not just quite up on reading, that is, that we are a little deficient in our reading, I at this time take occasion to suggest to the county man

agers of institutes, that they get in correspondence with the State Librarian. They can procure, at a nominal cost and expense, for their communities and counties and townships, a supply of these traveling libraries, selecting such books as directly apply to education along the lines of agriculture, and the arts and sciences, history, biography and all these things that will broaden out and elevate the minds of the boys and girls in the families upon the farm.

Time will not permit to speak further upon this matter. I am gratified that Mr. Kates has called our attention to this, and I only regret that Mr. Montgomery himself is not present to fully present this matter to us upon this occasion.

MR. KAHLER, Lycoming County: Mr. Chairman, I would just like to say a word in regard to this library question, in which we have had a little experience. As has already been stated by your good friend, Mr. Kates, you can get them upon application by signing a bond for the proper care of the library, and as he has already stated, all that it will cost is the transportation, namely three dollars, and then we can select from a number of books the kinds of books wanted. And I will say further, that you will find that the literature is first-class and up-to-date in every respect. The way we manage the matter is this: Before we let the volumes out, we appoint a librarian, who takes the names of all persons taking out the books. They are not allowed to keep them over ten days without permission. At the end of that period they can return one book and get another; each person taking out a book is charged with it, and under obligation to return it in good condition. After the library has remained in our care for three months, we are expected to return it, or file an application for its retention during another period, or we can exchange libraries with some neighboring community, and in that way save transportation, although we have to pay the expense of transportation every time we make a change.

I am very much pleased that our Director of Institutes has recommended that the chairmen of our different counties bring this to the attention of the people in their several communities, because the whole thing of agriculture simply boils itself down to education, and that is one of the means of obtaining it. I hope it will be taken up and acted upon in every county in the State.

MR. HERR: Mr. Chairman, just one thought in regard to that syllabus; I do not believe it is practicable unless you have the syllabus in advance and have it published in the county paper. It is too late when it comes to the institute. You cannot distribute them at the proper time, and the only thing I see would be to get it in advance and publish it in the county paper; and then the other difficulty I see is, that perhaps the speaker will not be there himself.

MR. HUTCHISON: Mr. Chairman, I was just going to say a word in regard to Mr. Kates' suggestion as to traveling libraries. The matter was presented to the State Grange and quite a number of these libraries are now in use in the different localities, doing good work. You can get them by sending a fee of ten dollars, and appointing two trustees. We have in our grange now the third library, doing good work. We have found them to be very good books, and our people are very much pleased with them. I hope that the directors and others here will take advantage of this offer. I know that Mr. Montgomery is very anxious to do all he can for the country people throughout the Commonwealth.

MR. WITMAN, Elk County: Mr. Chairman, the situation in Elk county is somewhat similar to that described by my neighbor and friend, Mr. Howard. There is only one locality in my county where the farmers attend institutes, in fact, it is the only real farming community. They do not gain their livelihood in Elk county by farming. It is from the forests and mines. I might experiment with the same inducements my friend Howard did, but I would make a few substitutions in this lottery plan. Now the question arises, Is it worth while to have such an audience? I think not. As long as we have such a condition of things, and the people of Elk county do not depend on the farm for their living, I do not think the inducement will be sufficient to get them to a farmers' institute. I think we would highly appreciate a course in farm science. If we could have a similar course to that in our high schools, I think it would be very much appreciated, and very beneficial. Let us have a system, and we have people who will appreciate it. Our institutes are not quite equal to what they were several years ago just on this account. The subjects that have been presented of late are worn out and we need something new that will awaken a new interest.

MR. HALL, Potter County: Mr. Chairman, as one of the members who are indebted to Mr. Kates for his kindness of yesterday, I want to say that it was the regret of every one that we had no opportunity to express our appreciation of his liberality and kindness, as we did not know the gentleman yesterday, and I move you sir that this institute give him a rising vote of thanks for the courtesy and kindness which he extended to us.

The motion having been duly seconded, it was unanimously agreed to by a rising vote.

MR. KATES: Mr. Chairman, I may say, in acknowledgment, that while Dr. Detrich and myself were very highly gratified that you took the trouble to come over to our farm, the debt is entirely on our side.

MR. BILLINGS, Erie County: Mr. Chairman, as the most of you

know, Erie county is practically a dairy county, and I am right in the midst of the dairy section in the southern part, and what I may have to say will refer principally to the topic of dairying. Now in regard to the county chairman. The first thing he has to attend to is attention, and to get attention he must get his audience to work, and in order to get his audience to work, he must get his speakers out in front where they can be seen and heard. I was very glad to see that brought out here. I was very glad to see that these chairmen were called out as they were here, and the five minutes' limitation that was given us, was a good point illustrated here in this meeting, because there are chairmen here and there are lecturers that would take the whole time, if permitted, and there are chairmen here and many of them, myself among the number, who would not have got up and said anything unless we were called out.

There is one thing that I want to mention, that I am sorry to see in our meetings here. I have observed that our lecturers are the ones who do the most whispering. Now it is very embarrassing to the chairman of a local institute to be annoyed in that way. While we are not annoyed in our local meetings in that way, we are here. Of course you lecturers are not especially interested, probably, in these discussions in reference to the duties of the county chairmen, and you don't care to hear what we say, so you get among yourselves and talk, and it does annoy our meeting.

As I have said, get your speakers out in front; I think that is the first thing to do. Many times it is hard work for the local manager to get his speakers out in front of his audience so that they can be heard. They will stand back, and they will get twisted around sideways and it creates an uneasiness and there is difficulty in hearing, and the audience soon tires, even the professors and our superintendents of schools are sometimes quite diffident about getting out in front. They want to get up and speak where they are, but I say, bring them out to the front.

Another thing I think is quite important, and that is, for the chairmen to surround themselves with two or three good helpers; good responsible men that he knows will be there. I might, if I had time, give you a little experience that I had last winter. My helpers all fell off but one, but he was a man that I could depend upon and we pushed our institute right through. One-half of our speakers did not appear, but still we made a success of it, so I say, surround yourselves with two or three or four good responsible men who will stand right by you, and you will make it a success everytime. Let there be an institute located where the people want it. If the people do not ask for institutes you will have hard work to get such communities interested in the institute work, and to get them to do the work required to make an institute a success.

A few topics that I think would be of value, and interest to the farmers of our locality are, as I said at the outset, those specially related to dairying; and another one is, better roads. And I would like it, if in this meeting we had time to have Prof. Hamilton, or some one else, explain that we might take it home for consideration.

MR. HEGE, Franklin County: Mr. Chairman, I gave my time to Mr. Northup. When Mr. Northup took his seat, I felt like a colored brother we had at Chambersburg. He was not a very good brother, for sometimes he didn't tell the truth. He always had some colored man in the audience to say "amen" to what he said. One day he had a fellow picked out to say amen to what he said, but he didn't do it, and when the meeting was dismissed, he took him to task for it, and said, "Now Brother, you didn't say amen as you agreed to." "No," he said, "you lied, and I don't say amen when you lie," but Mr. Northup told us the truth, and I could heartily say amen to it.

I am sorry I don't remember the speaker's name who told us that up in his county there was only one place that he could hold an institute. (Mr. John M. Witman, of Elk county.) That it was a mining county and the people would not come out to be benefited. I think everybody ought to be benefited in a farmers' institute. I try to get the little boys and girls interested. You can educate them. A few years ago at Fayetteville, we were crowded for space in the afternoon, and a committee came to me and said, "This evening we are not going to admit the little boys and girls." I said, "How are you going to get over that?" "Why," they said, "we are going to have a man at the door and as the people enter we are not going to allow them to take the little boys and girls in." I replied, "That if I was going to an institute and had my little boy or girl with me, and I was refused admittance for the children, I would never come to your institute again." I said, "We will provide benches and chairs and seat the little boys and girls up there." We had forty or fifty or maybe sixty little boys and girls, and it was satisfactory to everybody. We want to be careful so that we don't offend anybody.

I know that before I was a member of the Board in our county, the institutes were always held in one place. The chairman would hold them for two or three days in his own town, and by the way, the people didn't take very much interest, only a few of his friends around town took an interest. He didn't introduce the strangers that came, that were anxious to know what a farmers' institute was; he didn't introduce them to the lecturers, but in a year or two he announced himself as a candidate for the Legislature. He was a Republican, but the Republicans didn't nominate him, and the next time he came out on the Prohibition ticket. He thought the Democrats would unite with the Prohibitionists but he was defeated, and then the next time he would have come out on the Democratic ticket

but they wouldn't have anything to do with him. We want to leave politics out of our institute work; it has no place there, and we should not permit it to exist.

MR. STEWART, Greene County: Mr. Chairman, I don't think that I have ever risen to speak until to-day. I have never been called upon, but I believe that when a chairman calls upon a private, he should rise. I am a believer in doing whatsoever thy hand findeth to do, and doing it with all your might. I possibly should rise for another reason: Being a comparative stranger here, in order that the men who may be sent to our county may have some idea of what manner of man will meet them when they enter the threshold of the county. The chairman is not able to do all things, but he can do many things with the co-operation of his people. The most important thing for him at first, is to enlist the co-operation of prominent people, and all the people, and it is proper for me to say that as far as I am concerned, as an humble chairman, that I shall endeavor to prepare the soil in Greene county to receive the facts and suggestions that are brought to us by the lecturers. I feel that it is a very wise provision of the State of Pennsylvania that these facts and suggestions can be brought to the doors and the firesides of the people of our county. I feel that I should be very modest in making any suggestions, but I have one suggestion, and that is that while heretofore in our county the first meetings have been held in the afternoon, I desire to suggest that the first meeting shall be held in the evening, because we will have a good deal better attendance in the evening session, and it will have a beneficial influence upon every meeting held thereafter.

The Chairman has suggested to us that we should state something or suggest something concerning our needs. I have not thought of that matter to any great extent, but I want to say that our needs are general. We have a wide variety of needs in our county almost all along the line of agricultural work, and consequently we need a variety of treatment to meet these needs. I want to say, gentlemen, that I want to render whatever service I possibly can in the work in which we are engaged so that it will reflect credit upon the Department as well as upon ourselves.

MR. HUTCHISON, Huntingdon County: Mr. Chairman, I would rather sit still and hear what the lecturers have to say to the institute managers. I would say first, to make an institute a success in any county, you must have the people's confidence and have them working together and have them helping to do the work. If any chairman starts in to boss the job, it will not be long until the people leave him. I get in touch with the Grange and try to hold my institutes in that section and get as many members as I can of that

organization interested. I try to get all elements interested, teachers and all. I like the educational idea. I think there should be a large section devoted to that and a person qualified to give instruction along that line. Then there is the question of domestic science, and all these questions that enter into home life; how to build a house and how to properly drain that house and heat it and light it.

But the great foundation of the work should be fertility. If we can raise good crops on our farms, improve their condition through the instruction received from these lecturers, then we have something tangible and practical to show for our work and something that will enable us to educate our children. I regard that as the great foundation for institute work, the proper preparation of the soil, and what it needs to bring better crops. Dairying should be one of your leading topics wherever the location is interested in that line. Then there is horticulture; that should be a leading topic. It should be studied, and the Director of Institutes should employ a suitable person to give instruction based on practical experience along this line.

I have had almost all the lecturers in this room in our county, and our people are alive on the subject. If you don't have a great crowd, if you get the farmers together, those who are really interested, if you have fifty farmers, or even half that number from the surrounding country you will do more good that afternoon than you will do with a large audience, if you get the proper instruction to these people. I do not believe in the one-day institute. It only gets people to them and they are done. With the one-day institute you have got your speakers on the road half the time and in the winter they get no rest. I hope that the time will come when we will have no more one-day institutes, but have regular two-day institutes, if not longer.

The CHAIRMAN: I think it is the duty of every county chairman to inform Mr. Martin what he wants in his section. A dairy section of course wants instruction along the line of dairying; a fruit section along the line of fruit growing, and so on. Now if the respective county chairmen will advise Mr. Martin what is wanted by the people in their several sections, he will no doubt be able to supply them with lecturers who will furnish them with the instruction and the facts they need.

MR. RODGERS, Juniata County: Mr. Chairman, I did not expect to say anything; but it is said, the first duty of a soldier is to obey orders, and if we are ordered to come forward here, we should not hesitate to obey.

As you are all well aware, the county chairman in our county is elected by the Agricultural Society of the county, and I suppose they choose as nearly the right man as they know how. There is no

electioneering done for it in our county. This is the fourth term of my service. I have never asked for it, and didn't want it when I got it.

I think that one of the first duties of the chairmen of institute managers of the county, is to realize that they have a responsible duty to perform, and they have to try and fit themselves and prepare themselves for the responsibility that is resting upon them, and in so doing, they must get in touch with the agricultural men, the farmers and the working class of people of the county in which they live.

I think one of the important duties of the agricultural society is, to elect a man thoroughly acquainted with the county, acquainted with the different localities, and the wants of the farmers, with the horticulturists, the dairymen, or the educational department of his county. Then the place of holding three meetings would come right in here if he understands the locality and knows what the people want. We never hold an institute two years in succession in the same place. We take our institute from place to place in the county. We have struck a dividing line in the county, like this aisle going over here, the river is the dividing line in our county. We hold four-days' institute, two days at the west end, and two days at the east end of our county, and we try to get them as far apart as possible, so that we have from ten to thirty miles between the institutes, and sometimes further. We go where the people ask for it, and every time we hold an institute, they always want us to come back to the same place. We don't have any trouble in getting audiences now.

In regard to holding meetings in court houses, the first meeting I held after I was elected chairman, was in the court house. I made up my mind then, that so long as I remained chairman I would not go to a court house again. Some of the men who come to the county seat, want to go to the different offices or stores on different business, and we don't get them interested in the work that we should have. Some of you may differ as to this, but we cannot do it. The place is fixed by the county institute managers. Our agricultural society elects a gentleman to be represented on the Board of County Institute Managers, our Pomona Grange elects a man, a good man, the man that the Pomona Grange has got in that position now, is one of the best men in our county. I am sorry to say that he don't belong to the agricultural society of our county or I would feel like resigning right away and have him elected chairman of institutes in our county. He is a most excellent man, Mr. D. Bayers, able, intelligent and honest.

In regard to the time of holding these institutes in the different counties, the chairman has something to say; and yet, after all, we advised the Department when not to appoint the institutes for our

county. Unfortunately they overlooked something one year, a few years ago, and we had the institute three miles, or less than three miles, from our county seat, and had the county institute just at the time court was going on, and had a murder trial, and you may know that that took the people away. That is the only institute that has been held where we have had a failure.

MR. CLARK: Mr. Chairman, we have now had a pretty thorough discussion along this line, and I move you now that this part of the program be suspended, and the lecturers be given the last half-hour.

The motion being duly seconded, it was agreed to.

On motion, it was ordered that the speeches be limited to two minutes each.

PROF. WATTS: Mr. President, I was very much impressed by a remark made by our representative from Elk county that we should have a systematic school at our institutes and have some new topics for discussion. I think what we want is some of the old topics discussed with new vim and in a new way. We cannot dispense with discussion on the important topics that effect every farmer, even if they are old, and I hold to the theory that it is not so much new topics that we need, as it is new light on the old topics, and the creation of a new interest in them by discussing them with new vim and new enthusiasm.

MR. SEEDS, Huntingdon County: Mr. Chairman, I can't get time to stop in two minutes. I want to say that I have traveled over the State of Pennsylvania and if I have said anything I am sorry for, I am glad of it. Every now and then they rub it in on me about my stories and I want to defend myself along that line. I havn't got anything to apologize for. When I go into a county like Kahler's county, they say, "Don't you tell that story in this town. A man in Lancaster told that story here, and the audience wouldn't accept it." Now I want to say, if a man steals my story and tells it, it is not my fault. I want to say another thing. I never tell a story unless there is a moral back of it. I am in the habit of telling some stories, it is true, and among them I have told a story that illustrates the idea that we have got to get away from home, and if the institute don't do another thing but get the farmer away from home, it is a success. The trouble with a good many is, they don't get away from home, and they don't come in contact with the world. They don't know what kind of people there are in the world.

There was an old farmer up here in the country near Scranton, and he went to hear Sam. Jones lecture, and before he went to hear that lecture, he didn't know that he didn't love his wife, and he sat in the hall in Scranton, and in that lecture, Sam. Jones ripped the

man up the back who didn't love his wife, and old man Hall said, "I am the man, I am the man," and old man Hall went away from that lecture with a new thought in his mind. It waked him up, and he said, "I am going back home and I am going to spark Mrs. Hall over again," and he left Scranton, and he went out home, and went into his house where he found his wife hard at work, and he put his arms around her and he hugged her and kissed her, a thing he hadn't done before for fifteen years, and she turned around, and said, "Go away, you old fool, you've been drinking."

Mr. W. H. Stout gave a synopsis of the following topic which is inserted in full, as follows:

THE COUNTY CHAIRMAN AND INSTITUTE LECTURER.

BY W. H. STOUT, *Pinegrove, Pa.*

This subject has been discussed before several previous meetings and is a somewhat complex problem. Acting in the dual capacity as assistant, advance agent, guide, and conveyor of baggage, also taking part in discussions, has offered me opportunities to form an idea as to the duties of county chairmen, and the qualifications in a speaker, before farmers' institutes.

My remarks are directed more specially to the inexperienced, and such persons as may have aspirations to become famous lecturers in the art of arts, the science of agriculture.

Before engaging as a lecturer, it would be well to learn the nature of the work and be prepared to adapt one's self to conditions, and possess the qualifications necessary to success. Coming during the winter months and the most inclement season, during all sorts of weather, when it is blowing and snowing, cold and rainy, long drives over bad roads, meeting good accommodations and the reverse, in warm rooms and cold rooms, among all sorts of communities, with plenty to eat, as a rule, generally well prepared, sometimes very indifferently, it is not always the most pleasant occupation. It is not becoming to the supercilious nursery-raised person brought up in luxury, comfort and ease, used to all the delicacies of high living, with servants at command, used to wearing kid gloves and fine toggery, and accustomed to the use of cut glass and silver spoons from infancy.

The perfect institute lecturer has not yet been developed. Life is too short to learn all the sciences relating to agriculture, and

practically but little of the numerous branches belonging to the art. A few essentials are a combination of theoretical and practical knowledge, the faculty to express it intelligently in plain terms, without straining oratory or eloquence, avoiding redundancy and circumlocution. The long-winded essayist or speaker is an abomination before the Lord, and before a farmers' institute. Half an hour is usually long enough to discuss an interesting topic, and if not interesting and instructive, it is twenty minutes too long. For an evening lecture on a literary topic longer time may be permissible, provided the audience is entertained and show appreciation, but to be subjected for ninety minutes to a collection of meaningless phraseology, a mere play upon nouns, pronouns, verbs and adjectives, conjunctions and interjections is almost beyond endurance, and no wonder that restlessness, yawning and expressions of "Oh, Lord," become audible in the audience. A certain degree of dignity, modified by modesty, is desirable, and accompanied with reasonable enthusiasm and good looks are captivating attributes. The speaker should possess integrity, not despise labor, be a cultivator, harvester and husbandman all in harmony with the work of the present day farmer.

Being a voluntary act on the part of the would-be-institute worker, it is optional with him to engage or not with the Department and it does not entitle him to assume special importance because of an appointment, and expect from communities treatment better or worse than is accorded other traveling men and itinerants. It happens sometimes during the institute season that contagious and infectious epidemics prevail, and thoughtless persons carrying contagion subject speakers and audience to danger about which county chairmen may be entirely ignorant. There are instances also in rural communities where a lot of young people gather for amusement after the meetings close, and by dancing late into the night creating much disturbance, when quiet and rest are desirable. These are a few of the contingencies encountered, and while somewhat annoying, we should be reconciled with the thought that when the young generation assemble in mutual enjoyment, the dangers of race suicide are somewhat remote in agricultural communities at least.

Like missionaries going into heathen lands, to brave the dangers, climatic changes or to be consumed by cannibals, the institute worker should be reconciled to his fate, and bear the burdens as a true hero without complaining to the Deputy Secretary, who has troubles of his own. All the county chairmen under whose jurisdiction it was my pleasure to be assigned have been kind and considerate and my co-workers congenial, generous and self-sacrificing. A speaker should not be condemned if through playfulness, hydrogen and oxygen are substituted for *spiritus, fermenti, puri*, or for pinning

up the sleeves and body of a night garment for another, because he may be ignorant of the usefulness of the one, and the utility of the other through inexperience.

Our work should be directed to the aid of the less informed, those honest, industrious people whose opportunities are limited, and to those benighted sections where modern methods have not been introduced, where ignorance and superstition go hand in hand, where signs of the moon and stars are consulted, where cattle are bewitched and troubled with wolf tail and hollow horns, and in fact an array of ridiculous notions prevail even to the cutting of hair of those who have any to cut.

There are a few up-to-date farmers in every community who learn, of their own volition, the things institutes are designed to teach. These are, however, not the ones needing instruction so much as do those of the elementary class and the classical instruction for the benefit of a few graduates who could be omitted without detriment to the cause. Whatever we may teach let it be what Dickens in "Hard Times" calls facts, facts, hard facts, and let them be verified facts and not preconceived ideas based upon improved theories. How to do work more easily, more economically, obtain better profits and get and keep more dollars, concern the average farmer more than any abstract science in existence. If the intelligence of an institute audience would at all compare with the highly intelligent audience gathered here, then the theory that only the highest class of scientific talent could impart the necessary instruction would hold true, but this generation at least, can receive useful information from those trained under the old curriculum, the three R's, "Readin,' Ritin and 'Rithmetic," seasoned by experience. The production of large crops alone does not conduce to the prosperity of the farmer, as is evident from the crops of cotton, apples and potatoes produced last season for which unremunerative prices were obtainable except in very favorable situations.

Finally, I will be frank to state that my humble services are not given out of charity, simply, and until I am informed by the Department that any of those engaged do not promptly make out vouchers and accept checks, I shall remain of the opinion that the rest of those engaged find it more congenial than milking cows, attending stock and marketing produce. Let it not be understood that I am ridiculing or condemning science, because I know its usefulness and value.

To illustrate my meaning, let me cite the occupation of the baker who supplies you with bread or even your good wife who can bake it better than any one else, yet in many cases those who produce good results never heard of the formula, or yeast plant, and know absolutely nothing about the chemical processes accompanying the

rising of the dough, excepting that a quantity of yeast and a certain degree of warmth are requisite to obtain palatable bread. Figure out, illustrate, bring specimens of insects, fungoids, root galls, black knot, etc.

MR. LIGHTY: Mr. Chairman, I don't know anything about the proceedings; I just came in.

The CHAIR: I will state for the information of the gentleman, that each speaker has two minutes to air his views, enter his complaints or anything of that kind.

MR. LIGHTY: Well now I understand from the Chairman, that the county institute managers have had some time, and now the lecturers have some time to kick or enter their complaints. I have nothing to kick about. I can give you my idea with reference to institute lecturers in a very few words. In the first place, the lecturer wants to know what his mission is, and then he wants to fully and entirely prepare himself to perform that mission, and then he wants to perform it effectually. If he does that, I believe he will make a success of it; he must be sure that he knows what he is there for, and he must proceed along lines that are definite, intelligible and practicable. If he does that, I am sure he will fulfil his mission and give good satisfaction.

MRS. MARY A. WALLACE: Mr. Chairman, I just came out to let you see your little sister. I am very glad to be with you and I want to thank you all for your kindness to me. I hope that this year there will be an addition to the family and you will have more sisters. There is a lady here that I want to present, and I am very proud that she is from Western Pennsylvania also. I would like to introduce to you Mrs. Orr, and ask her to say a few words to you.

MRS. ORR: Mr. Chairman, Mr. Orr knows that it will be impossible for me to say anything in two minutes. The subject of the meeting last evening was education, and I have watched it all along, and ever since I have observed it, I have become impressed that the whole question lies right there; that you must educate. You must educate your children; you must educate your sons and daughters, and you must educate your wives, gentlemen; you must educate them as you would educate yourselves. I say educate your farmers' wives so that they may become agricultural wives.

When at the World's Fair, which was a splendid event, celebrating one of the grandest of our historical events, the acquisition of the Louisiana Territory, and as we went into that great exhibition, right before us lay the wonderful rose garden where there were

sixty thousand roses cultivated. We went into Agricultural Hall and in that place there was a wonderful display of the great things of agriculture. I wish I had time just to touch upon two or three things that I saw in that agricultural palace, as they called it, that immense building covering over 23 acres of ground. The thought came to me that agriculture after all, is the very greatest of pursuits. We passed from Agricultural Hall and there standing out against the beautiful blue sky, for it was one of those clear days in the typical climate of St. Louis, and we looked up and saw on the top of one of those wonderful buildings, the majestic figure of Peace, and she spread her wings over the whole world.

(Mrs. Orr then reviewed at considerable length the history of the Louisiana Territory, and gave a very interesting description of what she saw in the dairy department, and spoke of it as especially an attractive educational feature.)

MR. MARTIN: We regret very much the flight of time, but the hour of twelve o'clock seems to have arrived. We have listened to very much instruction, which has been especially valuable to me in trying to arrange the affairs of the farmers' institutes of Pennsylvania. I shall be interested in reading over the record of what has happened during the past two hours.

Meeting adjourned to one o'clock.

West Chester, Thursday, May 25, 1905, 1 P. M.

Mr. M. N. Clark in the Chair.

The CHAIR: It has been arranged to take up No. 2 on the program for yesterday afternoon at this time, on the subject of "Poultry Breeding and Specialty Breeding," by Mr. T. E. Orr, of Beaver county, Pa. Mr. Orr will now address you.

(There were upon the platform a number of coops containing specimens of fowls used by Mr. Orr for the purpose of demonstration during the course of his address.)

MR. ORR: Mr. Chairman, the stenographer just asked me a moment ago if I had a typewritten copy of my talk. I want to say to you that I never had such a thing. The only sentence I had prepared was this: "Ladies and Gentlemen: I congratulate myself that I have for this afternoon a chairman who is a clergyman and, therefore, he will appreciate the merits of chickens." Now that would have been for the chairman of yesterday, but the chairman of

to-day is not a clergyman, but I am glad to know personally that he is one who does appreciate the merits of the old hen, so that I feel, on the part of the chairman at any rate, this audience will have his sympathy and co-operation in anything that we may say.

Mr. Orr then spoke as follows:

POULTRY BREEDING AND SPECIALTY BREEDING.

BY T. E. ORR, *Beaver Pa.*

The subject for this afternoon is "Poultry Breeding and Specialty Breeding." It is a subject that is entirely too large for anyone to attempt to discuss thoroughly within the time limits allotted.

Poultry breeding does not differ especially from other lines of live stock breeding in many particulars; it does differ in some, at least in this: You can see the result of your work sooner. You don't have to wait four or five years to know what the result of a certain cross of blood may have given you, as you have to do in the case of the horse or the cow; it will not require so long to show all the characteristic marks as shown in the dairy cow, the merino sheep or the thoroughbred horse. As I said, you see the results more quickly, much more quickly than if you attempt to build up, if you please, a herd of dairy cattle, or beef cattle or road or draft horses. To do that, you have to wait a long time before you see the result. In poultry breeding, whether you breed on a fancy basis or on a commercial basis, you reach the results that naturally come from the breeding of poultry, within a comparatively short time, and it seems to me that there is no topic that you can present to your people in your counties that should be of more interest than the breeding of poultry, because of the fact that you achieve returns more quickly that ought to be satisfactory to the man who wants good returns for his money. In fact, I believe that there is no line along the whole sphere of agricultural industry that has a market so ready to receive everything that you are able to produce, and I want to say to these farmers of Pennsylvania that the great State of Pennsylvania does not produce one-fifth of the poultry and eggs it consumes. That is true of two great states, Pennsylvania and New York. The city of New York, that great market, to say nothing of Philadelphia, under whose shadow we now sit, the city of New York consumes more eggs than the great State of New York produces.

Now where does the other four-fifths of the poultry consumed in the states of New York and Pennsylvania come from? They come from the West. We are importers where we ought to be producers.

Within a hundred miles of Pittsburg I know of a county-seat grocer who has used in a single season three carloads of eggs that he imported from Chicago in order to supply his people, and many of them were sold to the farmers of the surrounding country who ought to have produced them instead of importing them for their own use. There is a ready market, I say, for all that you can produce and the business is one, I will not say that anybody can learn in a moment—it is not true that any superannuated minister or school teacher can take hold of it and immediately make a profit out of it, because it is not a business that does not require the very best of care in order to make it a success, but almost anyone with reasonable effort and care should be able to succeed well enough, and to produce poultry and eggs enough for the family table, and something besides.

Some of the states are giving more attention to the subject than is Pennsylvania. I might call your attention to the fact that the great State of New York is holding poultry institutes lasting two days, and they get the best speakers obtainable. They seem to be getting profit as well as pleasure out of it. The State of New York has made rapid strides along this line in the hope that they will be able to supply that which they have for years been importing.

In discussing this subject, the subject of poultry rearing and egg production, I am not referring so much to the man who lives in a village or a town, but rather to the man or the woman who lives on a farm. No village man or woman has the opportunity enjoyed by the farmer who lives out in the country somewhat isolated from his neighbors. In fact, the farmer ought to be the one who raises the best horses, the best cattle, the best sheep, the best swine, and he also ought to have the best poultry.

I think it is not egotism on my part to say that I am fairly familiar with poultry conditions from New England and Florida to Texas and over the great Northwest, for I have studied poultry conditions in all those states with considerable care, and I want to say to you that I do not know of a man who has made a profit two years in succession who has done so with mongrel and low-grade fowls. It has always been done with pure bred or high-grade flocks.

Seeing Mr. Franklin Dye, the Secretary of Agriculture of New Jersey here, reminds me of an incident that occurred over in his state, when I was talking on the subject of uniformity of flocks, and we passed along in a carriage in which Mr. Dye takes his trips, and as we were riding along, he said as we approached a farmhouse,

"Here is a flock that will please you," and of course I was all anticipation, and I looked out with pleasure, and what sort of a flock do you suppose I saw? Well, Mr. Chairman, I saw just one hen, and it was all alike.

I want to say again that it is not the mongrel or the low-grade fowl that will produce the results we are after, and if you want to start a flock that will be profitable or if your wife is going to buy a setting of eggs for hatching, that is not the sort she should select. It is the man or woman that has some good variety that is going to succeed. And right here I want to suggest that in this poultry business there are more varieties and more opportunity for selection than in any other line of live stock industry, for of those bred up to the standard, there are some 125 varieties of pure-bred poultry and there is absolutely no success to be looked for from the cross-bred mongrel flocks that adorn, if I may use the word, so many of our farms in Pennsylvania. I want to repeat and emphasize that point.

I know of a wholesale grocer in the city of Pittsburg whose business is eggs largely and he handles three hundred cases every day—every business day in the year, and he pays out for eggs half a million dollars each year, and not a dollar of that half a million goes to the farmers of Pennsylvania. It goes only to the State of Indiana, where these eggs are bought and stored and shipped in to him every week in the year. So there is a market and an opportunity, and we have it right here in Eastern Pennsylvania as well as in Pittsburg in the western end of the State. You have here the New York market close by, also Boston, Philadelphia and Baltimore. You find a man who is able to supply any one of these markets with a good quality of fresh eggs and he will have no difficulty in making a contract for all he is able to produce, no matter what may be his facilities. You take a man who can guarantee that he can produce and provide so many dozen eggs a week in September, October and November and so on, through the season, and he is the man that can command his own price, will have no trouble to get fifty cents a dozen in New York in the winter time and not less than thirty cents a dozen at anytime, because they are willing to pay down there for the kind of eggs they want, first class, and only first class. So this great number of fowls affords you an opportunity to select whatever kind you may like. You may have a preference for one variety while somebody else may like another.

Our American standard of fowls is divided into a few great families. Our classification is first, families or classes, second, breeds, and third, varieties. We have the Asiatic families—all those large fowls with feathered shanks and feathered legs belong to the Asiatic

family—they are divided into breeds, the Cochins that we have here and the Brahma. They are sub-divided. There are quite a number of varieties of Cochins; the Partridge-cochin is one variety of the Cochin family, and there are several others, all breeds of the Asiatic family. To come to the American family, we have the old-time Java, two varieties, the Plymouth Rock, three varieties, the Wyandotte, seven varieties, all belonging to the American family. Now these fowls of the American family are clean shanked birds—sometimes they have a few feathers when you do not want them, but they should be clean shanked. All of them are fowls that will hatch and rear their own young. Then we have the Mediterranean family, producers of the kind of eggs that are liked in New York city. We in Pennsylvania do not discriminate particularly in this matter of the appearance and color of eggs, but Boston will pay from one to three cents more per dozen for brown eggs, while New York will pay from one to three cents more per dozen for white eggs, while in Philadelphia they will pay more for eggs that are all alike. Eggs that are white and uniform in size, they will pay more for them, simply because they are uniform. They do not discriminate so much in the Philadelphia market or Pittsburg market as to whether they are white or brown eggs. Our chemists tell us there is no difference in the quality; but if the bean eaters of Boston will pay three cents more for the eggs of the Plymouth Rock that are brown, by all means let us send our brown eggs there. If the New York people like the white eggs, that is the kind to give them. Those people who are getting sixty cents a dozen in the New York market are getting it because they send them just the kind of white eggs they want there. They will actually take sapolio and clean them rather than to send them eggs that are not perfectly white and clean.

As I said, we have a great chance to select our variety according to our preference, whether we would like to breed those of the Asiatic or American families. The first pure bred flock I ever saw was probably of the light Brahma or Cochin, the first pure bred flock, the first uniform flock that I ever saw in Western Pennsylvania was a light Brahma.

We have produced some wonderful fowls since then that are worthy of our attention. They differ from the Brahma in one or two particulars. I am very fortunate in having here a pair of fowls furnished by one of your citizens, Mr. C. C. Townsend—a pair of black Langshans, all of you who have dressed Cochins or Brahmas know that the skin is yellow. If they are fed upon corn they will be very yellow, but here is a fowl that is entirely different from that. It is a bird that comes, we suppose, from the same country, from the Langshan hills of China. To those who have not become

familiar with the Langshan characteristics I might state, that this bird, of all our varieties, comes nearer to being a turkey in quality of skin and flavor than any of the others that we have. These are the Langshans; it is a little hard to bring them in before an audience this morning.

These fowls come in two colors, the white and the black, but both of them have a peculiar skin, not found in any other of the Asiatic varieties. If you will turn up the wing you will find that the skin is of a pinkish white. If they were yellow they would be thrown out of the show-room entirely.

When you come to roast that fowl—dress it out—you will find that the skin is of a pinkish white indicating the difference between the Asiatic fowls and the American varieties. The Brahmas, Cochins, also the Plymouth Rock, are rather yellow skinned, and have yellow shanks.

If you go into the London market or the Paris market or especially the New York market, you will never see a French chef—one of those chefs of the great hotels in New York, selecting any of those yellow shank fowls if he can buy one that is white skinned, because of the fact that he knows that a yellow skinned bird is a thick-skinned bird with coarse fibre—a bird whose flesh is of a coarse fibre, and is also accompanied by a less sporty quality or flavor. He knows that with the thin skin you have always a fine texture and a superior quality. Here is the bird (exhibiting one) that comes nearer to the American turkey in quality than anything we have. The nearest approach to it now is an English variety recently introduced. All my life I have been a fancier of the American varieties, and as I have said, the American bird is good enough for me, but I want to say that we are sitting at the feet of people who have forgotten more than most of us know about this subject of poultry.

(Mr. Orr exhibited the fowls to the audience, and said): This hen illustrates a variety of fowl bred for show purposes. You will note these beautiful penciled feathers, each feather marked with two shades of brown, and these circles running around each feather. We have in this variety what is known as the Partridge-Cochin. These birds are inclined to be rather broody. If you want to have early birds, you get them to lay early and they will become broody and will furnish hatchers for your early birds. Notice the feathering on the shanks and on the heads. The English people are surpassing us in this variety, having birds so heavily feathered you will hardly recognize them. They exhibit a great mass of feathers. (Mr Orr exhibited to the audience another specimen of the fowls taken from one of the pens on the platform.)

Orpingtons were originated by Mr. William Cook, of Orpington House, England. He has been a lifetime in developing fancy fowls,

has really spent a lifetime in this occupation. His life ended last year; he passed away.

Mr. Orr spoke of Mr. Cook as having risen from the position of a coachman in England, and having devoted his life to the business of developing fancy breeds of fowls, beautiful in form and marked in qualities. He stated that when Mr. Cook passed away, he was said to be worth hundreds of thousands of dollars which he had acquired in breeding these birds. He originated and developed some half dozen varieties. Only one has been admitted to our standard but the others are likely to be admitted in the near future. Here we have that same quality of flesh, nice white flesh, thin skin, shanks are the same—pinkish white shanks, body full, round and long, and with a quantity of most excellent flesh.

Mr. Orr spoke of the folly of breeding the ordinary dung-hill fowl of the hit-or-miss variety, and of the necessity of uniform quality for marketing purposes. He said that the American people were beginning to discriminate in the matter of uniformity and that it was necessary to pay attention to this quality if one desires to achieve success in poultry breeding.

He spoke of having been in Missouri last year where he had a practical illustration of the value of uniformity when a farmer came in and offered to a buyer a lot of ordinary mixed chicks, and the price offered the same was twelve cents per pound. Later, another farmer with his wife drove up to the same buyer's place of business in a spring wagon, with a fine lot of chicks of uniform size and color, for which the buyer offered fourteen cents, and explained to Mr. Orr that the reason he did so, was because of their more marketable quality, due to uniformity of size and color, and the same principle applied to eggs that were offered for sale, and the buyer stated that if he didn't buy these chickens and pay the outside price, they would be sent to the Kansas City or Chicago market where they would find a ready sale and if he, the buyer, did not hold himself ready to pay the price, he would lose the trade of the people offering them to him for sale. He said the people demand uniformity of quality and they do not want to guess at it, they want to know it.

(Mr. Orr exhibited another bird from the lot on the platform.) We have here a bird surpassing any of our American varieties in quality and flesh. It stands next to the Langshan in that peculiar white flesh and in that desirable turkey quality of which I spoke in connection with the Langshan. It is the Buff Orpington of which I spoke a few minutes ago.

Mr. Orr spoke of his having brought into the house at his own home more than once, two fowls of different varieties that his wife might make a trial of their qualities by roasting them together so that they might determine the difference in their eating qualities.

He said that members of his family did not hesitate a moment in expressing their preference for the Orpington because of the thin skin and the abundance of well-flavored turkey-like flesh. He recommended that more attention be paid to the quality of the flesh in raising poultry; that in selecting the varieties for breeding purposes it would be a matter of cold dollars and cents to pay attention to egg-producing qualities and to the demand of the markets as to color and quality of the flesh as well as its quantity. He pointed out the similarity of the principles of breeding poultry for the market to those recognized in the breeding of the beef steer, and said that farmers who raise poultry should address themselves to an intelligent study of what is required along these lines. He pointed out and illustrated the fact that among fowls profitable for the farmer to raise, some are of the egg type in formation and others are of the flesh-producing type, and he called particular attention to the difference in shape of these respective types. He said that one of the advantages enjoyed by the breeder of poultry over the breeder of live stock—cattle or horses—lies in the fact that results are so quickly known, that the breeder of poultry would soon learn the result of his attempts to produce certain types which would enable him to profit by his experience.

Mr. Orr stated that he had no Plymouth Rocks to exhibit and expressed regret that such was the case. He stated that Mr. Temple had the promise of some for the purposes of illustration, but for certain reasons was unable to obtain them.

Mr. Orr stated that he wished to acknowledge his indebtedness and return his thanks to the people who so kindly furnished the fowls present on the platform for the purpose of illustration, mentioning particularly Mr. Townsend and Mr. William Moore, who furnished the specimens of Langshans, Buff Orpingtons and to Mr. Grove, of Philadelphia, who furnished the pair of Partridge-Wyandottes.

He stated that the Plymouth Rocks were found all over the United States from Maine to California, more numerous than any other varieties, while in the show-rooms there were more of the Wyandottes than any other variety. He said the Plymouth Rocks on farms in the country are the most popular birds in America. The Plymouth Rock has three recognized varieties, while the Wyandotte fowls have seven different varieties, all recognized as standard and one not yet admitted to the standard.

Mr. Orr illustrated the characteristics of these fowls by a practical example held up before the audience indicating their different points of conformation and peculiarities and characteristics of flesh and egg production. He said that the characteristic of the Wyandotte hen is a short body, short of shank, the hen standing close to

the ground. Some one has said that Hogarth's line of beauty is not found in live stock as thoroughly developed as it is in the Wyandotte bird, which is notably a bird of curves and not of angles. When you get a bird with angles, you get a bird that does not prove to be very satisfactory in egg production.

(Mr. Orr produced one of the specimen birds and stated that it had been brought there from a distance of 350 miles. He then exhibited the points of this bird and described its characteristics, saying it belonged to a line that had been bred for 25 years for a particular purpose. It was especially intended to illustrate a principle of potency in inbreeding with special reference to egg production).

I have no use for miscellaneous uncertain breeding, but I want to say to you that what has made the Jersey cow what it is to-day and what has made the thoroughbred horse what it is to-day is found illustrated along lines following the same principles of breeding as we find in the American fowls, in their shape and outline, more fully than can be seen in any other lines.

You will observe a great egg type in this bird, if you please (referring to a bird which he then held in his hands). She is a representative of the family which has been a great egg producer. This particular bird has been a good producer beginning at five months of age, her mother and grandmother before her were also great egg producers. Her mother was shown five years ago.

(Mr. Orr spoke of the advisability of selecting such poultry stock as would convert the feed given them into something which would be worth more than the feed, either eggs or marketable and well chosen flesh-producing breeds.)

(Referring to a bird held in his hands.) This bird is a great egg machine. I think it is not improper for me to say that there are some varieties that will lay twice as many eggs as others. I have two strains of white Wyandottes, one of them is here, the other one is not here; one will produce twice as many eggs as the other, and that is a matter of breeding, of specialty breeding. It must be followed up successfully and if so would result in making many a dollar now lost. (Taking out another bird.) This bird in shape is very much like a Plymouth Rock; the Plymouth Rock is medium in length of body, while the Wyandotte is short; this hen is long, too long in body to be in typical shape. It is characteristic of this strain to produce eggs rather than shape; they all do it, and I know by personal experience there is no type that will produce more eggs. The little brown hen that I showed you a moment ago, as I said, is a type of this and a good one, but I want to show you here for a moment and to call the attention of all those here who may

be interested in this subject and who care to study that matter of type to a hen I have here, if you were close to her you would readily see a difference of type in her shape; it is a good egg type, too. Those who can see will notice that this hen is shorter in body very considerably than the other one.

Now I am not one of those who believe that you can determine all the characteristics of a hen by the outside appearance. This hen, however, has proved a most excellent egg producer (referring to one held in his hands).

If you are going to make a business of producing fancy birds, if you are going to try to produce a show-bird, you want to breed to that type, select what is characteristic of those varieties. I want to call your attention to the egg variety particularly, that wide, broad, deep conformatin of the rear part of the body, the general typical shape that you want to get if you desire to have very great egg production.

We have here a hen of a type that would seem to indicate very satisfactory egg production. She is from a pen of my own, and I want to say to you that they have not earned their bread for the last three months. If you look at her you see she has all the indications of a good egg type, and yet as I have told you, she has not earned her feed for the last three months, so I say the type won't always hold. I brought this hen here for that particular purpose, to illustrate that fact and to call your attention to it. As an egg producer, she is not worth that (snapping his fingers).

The only way that you can reach success is to follow up your strain closely enough, and keep your record of them so accurately that you will be sure to know which ones do produce. The man who says he can tell by the type, by the shape which one will produce the most eggs, is like the man who says he can tell by the shape of the egg whether it will produce a cockerel or a pullet. He can't do it.

(Taking out another bird and exhibiting the same.) We have here a small bird, a bird that of almost all the birds of this variety is most active; they are all Wyandottes and great egg producers, great rustlers; you turn two flocks out in the morning of the same day, and here is a bird that will rustle and get over the hillside and be over on the other side while some of them, particularly these Partridge-Wyandottes will be lying around waiting for the next feed. There is something in the strain of the bird that shows egg production and meat production; still you must study it.

I want to say one thing, and that is on the subject of fresh blood; something which is doing more harm to flocks in the State of Pennsylvania than any other one thing. Select your best, breed your best, and mate them if you have suitable selections, breeding in the same strain but not too closely related. For example, if you

have been breeding barred Plymouth Rocks for four or five years of the Thompson strain and you think you ought to have fresh blood, go back to Thompson tell him what you have, and get something along that same line.

Having bred one of these varieties for fifteen years, I was impressed with the idea that possibly I might be breeding too close, so I purchased two male birds mating same with ten hens, which represented about the average of my flock, and as a result I got the veriest lot of mongrels that I ever had on my place. You don't want to do it; you don't want to run the risk; you want to start at the top; don't start down at the bottom. Take advantage of what somebody else has done; don't ignore the work that has been done by others and throw it away and attempt to do something yourself that will only lead to failure.

These Leghorns are the great producers of white eggs; all of the Mediterranean varieties produce white eggs, if you keep them warm enough, but you must have a house free from the wind in winter; you must have them in a tight house in winter. You don't need artificial heat to breed them. All over the State of New York they are breeding them by the tens of thousands without artificial heat.

I hope that I have succeeded in calling your attention to a few of these points which are of importance in the breeding of poultry. Now I would say to you, give that boy or that girl a chance on the farm to have something of his own or her own, something that every member of the flock will be as nearly alike as possible, something that will represent the sort of poultry that the people will want and something that is worth more money than the cost of the feed which you provide for them.

MR. DYE: Mr. Chairman, I don't want you to think that in all the flocks of the State of New Jersey there is but one bird that looks alike as my friend Orr seemed to intimate. If he will come and travel with me over the State of New Jersey I can convince him that we have very many over there that it would pay him to visit. I wish also to state that I have enjoyed this meeting very much. It has been one of great instruction and pleasure to me.

DEPUTY SECRETARY MARTIN: Mr. Chairman, we have been especially favored at this time and honored by visitors from our neighboring states. Yesterday we announced the visit of Mr. Dye, of New Jersey, and of Mr. Agee, of Ohio. Now to-day we are honored by the presence of Hon. W. L. Amoss, Director of Institutes of our neighboring State of Maryland. Mr. Amoss will please come forward and let us hear from him.

Mr. Amoss spoke as follows:

ADDRESS.

V HON. W. L. AMOSS, *Director of Farmers' Institutes, Maryland.*

Mr. Chairman, Ladies and Gentlemen: I came here as a student, as I suppose you all are at a normal institute. I came here to learn. My opinion is, that in doing institute work, we are not conducting a successful institute unless we are able to present to the people something that instructs and interests them, so if I have not something to give you, I had better sit down, or I am taking up valuable time that might better be applied to other uses.

Referring for a moment to the line concerning which I heard several addresses this morning as to the methods of doing institute work, I always think that it is my own fault if an institute is not a success, because I act as chairman at all our institutes in our state. We have of course a different system from what you have. We have what might be called the one-man plan. We have a number of local organizations and local institutes, but I think there is a place for the state institute. The state institute can bring men to discuss subjects and study your conditions and supply your needs better than can the local institute. A local institute certainly has its field in bringing out local talent and discussing local interests from your own standpoint, but the state institute has a broader field in which to operate, and I believe is certainly capable of doing a great deal of good by bringing attention to new methods, so there is a place for the state institute, and a useful place in comparison with the local institute.

I like your system, and in some places it would work, but in other places it would not. I believe that it is necessary to adapt yourselves to your conditions, and to meet those conditions, and so if, with all the opportunities that the institute director has of getting information and supplying the wants of that immediate section, if he does not succeed in that, it is his own fault. I think that if I cannot carry on the work along these lines, and if I cannot find and supply what is wanted in a given community to interest the people there, then it is my fault, and I am a failure. I have never met the man or woman that was not interested in something, and when I go to any part of my territory to conduct an institute, I always try to meet the representative men and women of that section, and then find out what they are interested in and supply their wants.

I have appealed to them in this way; I have gone into some places where they have seemed indifferent or have seemed set against the idea of holding an institute, and determined that a meeting should not or would not be conducted, and I have put it in this way. I have said to them: Now the state has appropriated money and has placed it in my hands to be spent in your community, and I have come here to ask you how I can spend some of that money in such a manner as to help you people with that money. Now when the proposition is presented to them in that way, if you show a man that you are trying to help him, and have money to spend in his interest, he is going to be a very narrow-minded man if he does not take hold and do something. In that way I have brought men to the institute and to my assistance that had not come before. As to the methods of doing the work, why that depends altogether on the conditions that you meet with at the place where you are. If I was to come here to conduct an institute, I should conduct it altogether differently than I would if I should go into some of our lower counties which are decidedly southern in every particular. I went into a town in the lower part of our state where we had called meetings several times, with the result that we had a very poor attendance, and it was rather discouraging to try to conduct an institute. Following the advice of Mr. Wing, who assisted me at one time in that state—he was with me when we had a splendid program and a very small attendance—I tell you this to bring out some of the characteristics of the man; some of you may know him. He was talking to an audience of only fifteen. We had a splendid program, but somehow the people did not seem to manifest much if any interest in the institute work. Finally he stopped and said, “If you are going to sleep, I am going to tell you a bear story.” He said, “Amoss, I wouldn’t talk to these farmers anymore. What’s the use?” I made up my mind that the next time we came to that place we would make a success of it, so when the time came for us to hold a meeting there again, I determined to secure the interest of the people in some way. We went around and met the ministers of the town, and explained to them what an institute was, what its object was, and asked them what they would recommend us to do to help their people and interest them. Then we went to the leading lawyers and then to the business men. By that time the day was exhausted. They took the work up and the result was a splendid institute. When we came into the town it was snowing and raining, and the slush was six inches deep, notwithstanding we had a good audience during the day, much better than it had ever been before. We were told that it was useless to try and conduct an institute there at night with the slush as deep as it was, because the people could not get out. I said, “Your town is small, why

can't you haul your people to the institute?" I said, "I will be over at the hotel, and if you want any help, I will help you." We had a lecture on domestic science on the program for that night, and we telephoned to everybody in town and got teams and hauled them there, and we had an audience of 110 there that night.

I only mention this as one way that proved to be successful in stirring up an interest in a place that had hitherto been indifferent. That is one way. There are other ways that may be adopted, but I have simply given this to you so that those of you who are studying new ways, may perhaps get some ideas from it.

I heard you say that you would like a two-day institute. So do I, but you can meet more people with a one-day institute. It is a question whether it will do as much good as a two-day meeting. I am somewhat undecided on that although I have managed both. I know this, it is very hard on the men; I don't believe in over-working the men; you want them to do good work; want them to have all their faculties and abilities in good vigorous condition; we don't want them over-worked, and some cannot do their best if obliged to work two days in succession. Our work on the whole for this last season has been very satisfactory. In this corn specialty work we are following some of those Western states. We took two men and had them lecture from one end of a car, stopping at such stations along the line of the railroad as we thought we could get audiences. The railroad assisted us in this, as a rule we took only thirty minutes for these talks, but sometimes we allowed forty-five minutes. That is, we would run in and out again in thirty minutes, and the point in doing that work is, you want to make it a clear-cut and concise presentation of the facts that you want to convey to the farmer. You must put it in such shape as to give him just what you want him to know. These trains were well patronized and our state has asked for them all over the state. It has been quite a hit in institute work, and for some purposes I think it is one of the best plans for the carrying on of institute work that we have met with.

MR. HALL, Potter county: Mr. Chairman, the advertising matter that the Department sends out, one part of it is in the form of large posters, which would reach from the flag (referring to flag on the wall) down to here. The first criticism I want to make of that, or the first suggestion that I want to offer is this, that the size be cut down one-half, because it is hard to tack it or to make it stand in the wind. Now as you all know, the State is divided into so many sections, and it is known who the State speakers will be. Now instead of leaving blanks to be filled in, the suggestion that I want to

make is, that the names of the State men be printed in, and no blanks left, so that we will have a neat and complete poster.

I want to partially approve of the postal card advertising as it is sent out; we want a little change in that. It says "You are notified." Just leave the "you" out so that it can be filled in "you and your family" or "your friends," or something of that kind.

The CHAIRMAN: We will now take up the first number upon our program for this afternoon, "Doubling Crops in Market Gardening," by the Hon. R. F. Schwarz, of Analomink.

(NOTE.—It was understood by the stenographer that Mr. Schwarz would furnish a copy of his address for this Bulletin, but up to the date of going to the printer Mr. Schwarz had not been able to furnish the Department with the copy.)

(NOTE.—Owing to having met with a severe accident, Dr. I. A. Thayer, of New Castle, could not be present to present his paper, as per program, "Tile Draining: Why and How.")

The CHAIRMAN: We will now take up No. 3 upon the program: "Growing Early Vegetable Plants," by Prof. R. L. Watts, Scalp Level, Pa.

The following paper was then presented by Prof Watts:

GROWING EARLY VEGETABLE PLANTS.

PROF. R. L. WATTS, *Scalp Level, Pa.*

(The lecture delivered by Prof. Watts was illustrated so far as possible by photographs and actual plant specimens brought from his home. No manuscript was used and the paper which has since been prepared discusses briefly some essential points which were not considered in the lecture on "Market Gardening," given at the last Farmers' Normal Institute, published in the Proceedings of the Normal Institute Bulletin, No. 131, page 191.)

Importance of Early Vegetable Plants.

The importance of early vegetable plants is not half appreciated in most localities. Nine-tenths or more of the farmers of our State do not know anything about the luxury of having real early vegeta-

bles for their own tables, excepting a few which may be grown without the use of glass. Tomatoes are not usually found on the farmer's table until about the first of September and many do not have ripe tomatoes until time for destructive frosts. No vegetable is more wholesome or more enjoyed, and every possible effort should be made to have the vegetable during the longest possible period. It is not difficult to produce ripe tomatoes by the 15th of July in practically every section of the State, and earlier where the exposure, soil and climatic conditions are most favorable. Cabbage is not usually ready for the table until well into August or the first of September, and later on many farms. It is easy to have at least a few solid heads by the first of July. Celery is not usually ready for use until late in the autumn. This vegetable is noted for its health-giving qualities and should be grown ready for the table by mid-summer. We might increase the list of vegetables which may be had much earlier than is customary.

Thousands of farmers in the State grow vegetables in greater or less quantity for local or distant markets. What percentage of them reap satisfactory profits? Many may be well pleased with their results, but comparatively few make the business as profitable as it should be, and one of the most potent causes of small profits is that the vegetables are not really early. They do not reach the market until prices are down and the cream is gone.

There is another demand for early vegetable plants, and a very large one. Village and townspeople who have gardens are always willing to pay good prices for fine early vegetable plants. One or two farmers in nearly every locality would find the plant business, in connection with the regular farm work, desirable and profitable.

The Seed Supply.

Anyone growing vegetable plants for the market or for use at home should exercise the greatest care in procuring seed. He should be thoroughly posted on the most desirable varieties for his particular locality. He should know where to buy the best seed of the varieties he wants and not pay very much attention to prices. Buy the best seed, although the price may be high. Some seeds should be saved at home. This is particularly true of the tomato. No seedsman could place on the market and sell the kind of tomato seed we have used this year. For instance, the tomato seed used on our farm this year was taken from the finest, earliest, most perfect specimens that were selling at wholesale prices for three and four dollars per bushel. Could any seedsman afford to do this? He could if the gardeners and farmers would pay two or three dollars an ounce instead of fifteen to thirty cents. When seed is

purchased it generally pays to buy from the seedsman who has introduced the varieties wanted. He usually exercises more care in the production of seed of the varieties in which he is particularly interested. Good seed means fresh seeds, of the best types, plump, large and of high germinating power. A careful test of the germinating powers of the seeds should be made before the proper dates for sowing.

The Soil.

The soil for growing early vegetable plants must be considered physically as well as chemically. In fact, the physical composition is of greater importance and demands more study than its actual supply of plant food. The conditions of the soil, mechanically considered, must be such that it will not bake seriously and that the drainage is perfect. This condition may be secured in any soil by adding the proper amounts of vegetable matter or manure and sharp sand. A very practical way to do this is to haul the soil to a convenient spot, spread about eight inches deep, add four inches of manure free from coarse litter, and a couple of inches of sharp sand. (If the soil is naturally loose, sand will not be necessary.) Let the soil and manure remain in these layers until soaked by rain and when sufficiently dry, plow at intervals of a week or two, harrowing thoroughly to incorporate the manure with the soil. This soil should be prepared before mid-summer, and late in the fall thrown into piles and hauled to the cellar, cave, stable or other storage house where it will not freeze. Preparations in the way of a liberal supply of soil must be complete before winter sets in or there will be trouble when the time comes to begin sowing seed.

There will be no occasion to worry about the chemical properties of the soil if it is prepared as explained above. A very small quantity of chemicals may be added but it will not be necessary. It is always desirable to mix lime in soil to be used in starting cabbage plants as a preventive of club root, and if there is reason to believe that the soil lacks fertility, pure bone meal, free from acidulated goods, may be used liberally with entire safety. No harm can result from making one-third the bulk bone meal. Of course this would be extravagant. A peck of bone meal or even less to a barrel of soil is sufficient for excellent results.

The Effect of Water.

Only experience teaches the gardener the effect that water has on the young plant as well as the soil and enables him to determine just when and in what quantity water should be used. We believe that the improper use of water has more to do with failures or

poor success in growing plants than any other one factor, and it is most difficult to give positive instruction along this line. In general it may be said that so far as actual results are concerned water has the same effect as heat and plant food. That is, plant growth may be stimulated by increasing the temperature, adding more plant food or by the use of more water. If all these conditions are the most favorable for the particular plant being grown, we may expect perfect results. If any one of these three conditions is not right the effect in the end is practically the same. Suppose, for example, we are growing a tomato plant and it is not making the progress it should. The soil and atmospheric conditions are studied and it is determined that the soil contains plenty of plant food and an abundant supply of moisture while the temperature in the house or frame is too low. Heat is needed and when applied the plant starts off with new vigor. If the supply is too dry, although it is rich in the elements of plant food and the temperature is exactly right for tomatoes, satisfactory growth can not be expected until more water is added. Probably the supply of plant food has less to do in growing a good plant than either of the other two factors, for it is a wonderfully poor soil that cannot be made to produce an excellent plant if the temperature and supply of water are under perfect control. The grower should always keep in mind that water is the greatest key to unlock plant food and he can use this key at will. Plants soon become stunted when there is not a regular and constant supply of water, and over-watering has the opposite effect in producing a weak, spindling growth. Watering should be attended to regularly and systematically and the aim should be to maintain an even supply. This is especially important at the time of germination. A lack of soil moisture while the seeds are sprouting may cause a low percentage of germination, an uneven stand and stunted plants.

Dates for Sowing.

The proper dates for sowing vegetable seeds requiring glass are determined by the usual progress or advancement of the season in different sections of the State. Seeds for early vegetables should be sown from one to two weeks earlier in the southern counties and in the vicinity of Philadelphia than in the mountainous parts of the State and in the northern counties. The dates when it is considered safe to transplant to the open ground must regulate the dates for sowing. In our own county of Cambria, it is not too early as a rule to set cabbage in the field by the 15th of April. The seed of early cabbage should be in the ground not later than the 1st of February, and a few days earlier is an advantage. It is too risky to set tomato plants in the field before the 20th of May, and the seed should

be sown not later than the 20th of February when two transplantings are to be made before taking the plants to the field. Egg plants and peppers should be sown fully as early as tomatoes and earlier if you haven't a very warm place to keep the seed boxes. Sow celery, lettuce, cauliflower and kohl-rabi at the time the cabbage is started.

Transplanting.

Transplanting is an absolutely necessary operation in the work of growing early vegetable plants. By sowing the seed thickly a very limited amount of space will grow a large number of plants. For example, it is an easy matter to start 1,000 cabbage or tomato plants in a flat 14 x 20 inches. When transplanted, not more than 140 cabbage plants should be set in this same size flat, and twenty tomatoes will be as many as can be set in the box if you want to grow fine stocky plants. It will be seen that a small hotbed of two sash is large enough to start at least seven thousand celery or cabbage plants, while ten times this number of sash will be required to care for the plants after they have been transplanted. Another advantage of transplanting is that the root system is enlarged and improved, and when the plants are taken out of the boxes carefully a considerable quantity of soil and manure clings to the roots which is an immense advantage in giving the plant a quick start. A large percentage of manure placed in the bottom of the flats before transplanting, or incorporated with the soil, increases the amount of material which will adhere to the roots.

Some vegetables, such as tomatoes, egg plants and cauliflower, always command high prices when placed on the market very early in the season, and it pays the grower to exercise special care in producing the finest possible plants ready for the field the first day that it is considered safe to place in the field. We have found in our own practice that it is the most profitable to transplant early tomatoes twice before setting in the field. The seed is sown on the greenhouse bench or in the hotbed not later than the 20th of February. In four weeks the plants will be ready for the first transplanting which is done on the benches of the greenhouse, allowing an inch and one-half, or two inches between plants. In three or four weeks the plants will be three to five inches high and must be transplanted promptly or spindling plants will be produced. They may be set in flats, allowing from three to six inches between plants, or better, set in discarded berry baskets, cans or earthen pots. Where there is a large number of plants to be grown every year, the most satisfactory plan from every standpoint is to use earthen pots. The larger the pot the better the plant that can be grown. It is probably very seldom that it will pay to use larger

than a four-inch pot, and the three-inch size is very satisfactory. A larger size makes much more material to handle, thus increasing the expense as four-inch pots cost at least one-third more than the three-inch size. For the earliest tomatoes, it is a decided advantage to keep the potted plants in a greenhouse or hotbed although most excellent plants may be grown by placing the pots in cold frames immediately after transplanting which, in this section, would be about the 20th of April.

(Notes on the construction and use of hotbeds and cold frames and the general care of plants are published in the bulletin to which we referred in the beginning of this paper.)

The following questions were asked during the delivery of Prof. Watts' address:

A Member: What depth of soil do you use in your greenhouse beds?

PROF. WATTS: About five inches.

MR. SCHWARZ: You have manure under that, don't you?

PROF. WATTS: We have a small quantity of manure.

MR. SCHWARZ: Excuse me; your plants are not usually as large when you put them in, are they? (Referring to plants exhibited by Prof. Watts—tomato plants.)

PROF. WATTS: No, they are not ordinarily quite as large as that; in fact, I would rather have a plant not quite as large as that; it will make a better plant than one larger.

The CHAIRMAN: Do you want your bone meal ground real fine?

PROF. WATTS: Yes, as fine as you can get it.

A Member: About what depth do you use for boxes?

PROF. WATTS: We use boxes just about like that. (Exhibiting one.)

A Member: That box is about two inches deep.

PROF. WATTS: Yes, just about two inches deep.

A Member: Do you find that box deep enough for the last transplanting?

PROF. WATTS: Yes, you will grow just as good a plant.

A Member: What do you consider the best early tomato?

PROF. WATTS: Maules Early is a splendid early tomato.

MR. SCHWARZ: Have you tried the Livingston?

PROF. WATTS: It is rather a different tomato from any that is on the market; I think it is a fine tomato.

The CHAIRMAN: We will now take up No. 1 of Wednesday afternoon program, which was deferred at that time on account of our visit to Mr. Kates' farm. We will now hear from Prof. Franklin Menges, of York, Pa., on "The Advantages of Corn Breeding to the Pennsylvania Farmer."

Prof. Menges read the following paper:

THE ADVANTAGES OF CORN BREEDING TO THE PENNSYLVANIA FARMER.

BY PROF. FRANKLIN MENGES, York, Pa.

I shall not discuss the botany of corn but simply say that it is a member of the large grass family, that the botanical name is *zea Mays*, that it is an annual, growing, ripening and producing seed and dying in one summer, and that in the classification of farm crops it belongs to the cereals or plants producing a mealy seed which is prepared for food.

In discussing the subject of the advantages of corn breeding, it may be said that Illinois, which is a corn breeding state, produces annually nearly 400,000,000 bushels of corn and consumes 260,000,000, while the State of Pennsylvania, the second dairy state in the Union, produced in 1903 45,500,000 bushels, and in 1899 nearly 52,000,000. The crop of 1903 averaged 31.2 bushels per acre; the crop of 1899 a little over 29 bushels per acre.

About one hundred average size ears make a bushel and on an acre of corn, when the hills are 3 feet 6 inches apart each way, there are over 8,000 stalks with two stalks to the hill and under normal conditions, should we raise a normal size ear on each stalk, we would have at least 80 bushels of normal ears per acre, whereas, with our present practices we have only a little over one-third of what we should have. The question with us now is how can we

increase the yield and why is it that we have so low a yield and what can the corn breeder do to increase this yield. I think we are all going to follow the suggestions I am about to give, therefore, we will begin with the corn we are growing this year. The first thing to know is whether we have a corn suited to our soil and climate and select seed corn from this variety.

Every corn stalk has an individuality, like every animal, a something in which it is superior or inferior to others, all of which are apparent to the studious and trained observer. The stalk may be devoting its energy to the production of an enormous stalk with a small ear way beyond the reach of an ordinary sized man and, therefore, an ear that will ripen later on. The stalk may be too small and the ear too large and too low down ripening too early or it may have too many leaves or too little foliage, etc., therefore, the seed corn should be selected with reference to a stalk such as we desire in which the energy has been devoted to produce the object we desire to accomplish, namely, a perfect ear with a medium long shank that will keep the ear in the right position. A stalk that holds the ear to the right height, and will ripen medium early and strong enough to withstand storms such as are usual in the vicinity in which it is grown. The ears must be thoroughly ripened on the stalk after which the stalk can be cut and placed in such a position as to keep perfectly dry or the ears may be taken off the stalk and dried.

The Ear.

In selecting seed corn, all the ears should be of the same type, maturing about the same time to insure thorough pollination. The very early or very late stalks are usually barren for want of pollination, and if pollinized, produces grains of different sizes and shapes which makes it impossible for a planter to plant them evenly. A perfect ear of corn should be full and strong in the middle portion indicating a strong constitution. It should retain its size to near the tip and be well-rounded and filled with kernels. The kernels should lean over the cob at the butt end. The rows of kernels should be straight and uniform in size merely wide enough to admit air to facilitate drying. The ear should be 10-12 inches long, $7\frac{1}{2}$ -9 inches in circumference, contain 16-24 rows of grains, shell 88 per cent. corn to the ear and, if the corn is yellow, the cob must be red, if white, the cob must be white.

The Kernel.

The shape of the kernel will vary with the variety, but in general it should be wedge shaped, because this shape gives space for the greatest possible amount of corn to the cob. It must be full and

strong at the tip giving room for a large germ which is essential to strong vitality and high feeding value. The edges of the kernel should be nearly straight but sufficiently convergent to allow the rows to fit closely together and should be 5-16 of an inch in width, $\frac{5}{8}$ of an inch long and about $\frac{1}{8}$ of an inch in thickness.

Preservation of Seed Corn.

Much seed corn is injured by improper methods of drying and storing, especially during the first month or six weeks after husking, at which time it contains 25 per cent. or more of moisture in the kernel and cob. It should, therefore, be hung up or placed on racks made of narrow strips with spaces between for air to pass in, a dry and well ventilated place. If this is not done its vitality is almost sure to be injured by moulding, fermenting, germinating or freezing. Seed corn should always be stored in the ear and never be kept in boxes, barrels or sacks. Natural drying, if there is time, is always safest. After this selection is made during the winter or at least six weeks before planting, a final selection should be made. This can best be done by selecting a single ear representing the type wanted with regard to shape of ear and character of ear and character of kernel. With this ear in hand, compare all the rest and select a sufficient number of ears most closely representative of the type desired.

Testing the Germinating Vitality of Each Ear.

Many a field of corn on account of imperfect germination has to be replanted or is patched up by planting odd hills, which is usually labor thrown away, there being insufficient pollen to properly fertilize the late silks, or a poor stand is allowed to remain and largely reduce the yield per acre; therefore, on a well conducted farm the germinating vitality of every ear intended for planting is tested. This can be done in a number of ways. One of the easiest and one that insures natural conditions can be done by making a box 2, 3 or 4 feet square and 2 or 3 inches deep, fill it with sand or soil and line it in blocks $1\frac{1}{2}$ inches each way and keep moist and at 70 F. Take 6 grains from each ear—one from the butt, middle and near the tip of the ear, turn the ear and take three more grains similarly, place them in square No. 1 and label the ear No. 1; do the same with another ear and label it ear No. 2, and so on until the box is filled or as many ears as are needed for planting. In four or five days the germination will be complete. Sawdust can be used in the same way. Suppose of the six grains in square No. 1 only four produce sprouts, which means a germination of 66 2-3 per cent., suppose in square No. 2 one of the grains produce only a germ for the stem and

another only a germ for the root, which always comes first, or an embryo stem and an embryo root, which virtually means only a germination of 66 2-3 per cent., because a grain that produces only an embryo root can not produce a stalk, and one that produces only a stem, if it makes a stalk at all, will be weak and will produce, if any ear, a nubbin. Suppose grains in square No. 8 all produce both germs, but two of them are small and sickly and have low vitality, which, under the best conditions will produce only a weak plant, which will yield but a nubbin. (Here we are getting on the track of the nubbin-producer.) None of the corn of the above indicated ears should be planted; in fact, only ears having a germination of 94-95 per cent. should be planted. Beginning with such a corn, under normal conditions we have the assurance of a good stand of strong and vigorous plants. After this germinating test 20, 30 or 40 ears which have given the highest per cent. of germination and are good specimens of the type of corn adapted to the soil and climatic conditions, should be selected for a seed corn breeding plot and only corn from one ear should be planted in one row and no other and the row numbered one. The corn of ear No. 2 should be planted in row two and no other; corn of ear No. 3 in row three; the corn of No. 4 in row four, etc., until the breeding plot is as large as may be desired.

Here we have a chance to observe the ears and have a performance record of every one, and in this way eliminate all that will keep down the yield. I have here a nubbin. If that nubbin is produced because of some ancestral weakness, the likelihood is that if it were possible for me under the old system of seed testing or planting or without testing, as most farmers do, to find the brothers of that nubbin, they would be nubbins also. If it were possible under similar conditions to find the brothers of that ear only one-third of which has grains, due to imperfect pollinization, because of the late production of silk, which may be an ancestral weakness, I would find that they too are race suicides. If it were possible to find the ancestors of the barren stalks in our corn field we would then discover a family weakness which gave it a tendency toward that sort of thing. But by the process I have indicated we place ourselves in a position to eliminate all those weaknesses in so far as they are due to seed and heredity. Suppose in row number one produced by ear No. 1 there are 25 per cent. barren stalks, which is not a high estimate, for as high as 40 per cent. have frequently been found. Will we select seed corn from that row? Not if we know our business. And are we not in position to eliminate the barren stalk? Suppose in row number two we have a large number of nubbins, reducing the percentage in yield maybe one-half. Will we select seed corn from that row? And are we not in a position to

eliminate the nubbin in so far as it is due to heredity? We can eliminate the sucker producer, the broken stalk, the stalk with ears too high or too low, the stalk which puts too much vitality into the production of stalk and leaves, the stalks that do not produce the right sort of shank, that ripen too late or too early under the right kind of culture, soil and climate. With all these weaknesses eliminated we should at least double the yield of corn in Pennsylvania, and instead of having 31 bushels per acre we would have 62, or instead of 52,000,000 bushels we should have 100,000,000, which would mean \$25,000,000 for the Pennsylvania farmer—quite an advantage. Corn is as amenable to improvement in quality as to increase in quantity. The grain of corn is composed of six principal parts, namely: First, the tip cap covering the end of the kernel, to protect the germ; second, the hull, which is the thin outer covering of the kernel; third, the horny gluten, or the hard horny part immediately under the hull, and is the richest in proteïn of any part of the corn kernel, but is not entirely proteïn; fourth, the hard or horny starch next to the horny gluten, which can be seen to differ both from it and the starch between which it lies, and also contains a large proportion of proteïn; fifth, the starch occupying the crown of the kernel and usually surrounds the germ, except in high proteïn corn; sixth, the germ occupying the center of the kernel and ending at the tip and extending toward the crown one-half or two-thirds of the length of the kernel, and contains the embryo stem and the embryo root. The germ contains from 80 to 85 per cent. of all the oil in the kernel and the germ, the horny gluten and horny starch contain 80 per cent. of the gluten found in the grains of corn.

I have here diagrams showing the component parts of a low and a high proteïn grain of corn. The one has a nutritive ration of about 1-14, and the other of about 1-8, or in other words, one has one part of proteïn, muscle, blood, bones and milk-producing substance, to 14 of fat and heat-producing substance, while the other has one part proteïn, muscle, blood, bone and milk-producing substance to only 8 parts of fat and heat-producing substance—a very good fattening ration. Why is this difference in the component parts of the grain of corn? Because just as there is a tendency in some ears to produce barren stalks, nubbins, suckers and many other defects, as well as in others to produce perfect ears, so there is a tendency to change the chemical composition of the grain of corn, and corn breeders throughout the West are taking advantage of this and are producing varieties of corn adapted for the purpose it is intended to serve.

Immense quantities of corn are used in the manufacture of glu-

cose, whiskey and starch in the West. Corn that is intended for making whiskey, glucose and starch should contain a large amount of starch, because it is the only part of the grain of corn that can be converted into whiskey and glucose. These whiskey and glucose manufacturers have developed a corn rich in starch and oil, because one pound of oil is worth as much as five pounds of starch, and one of the large glucose manufacturers of Illinois, which consumes 50,000,000 bushels of corn annually, pays five cents per bushel more for a high oil corn than a low, which means \$2,500,000 for the farmers, who produce this kind of corn. If the whiskey and glucose manufacturers can produce a corn adapted for their business why cannot the farmer? The farmer wants a corn rich in muscle, blood and bone, and the dairyman in milk-producing substance, or a corn rich in protein. In the State of Illinois, beginning in 1896 with a corn that had a nutritive ration of about 1-14, and by taking advantage of hereditary tendency of which I have already spoken, the Illinois Corn Breeders' Association, in connection with the Agricultural Experimental Station at Urbana, and under the direction of Prof. Cyril V. Hopkins and his associates, have developed a corn that has a nutritive ration of about 1-7½, and within the last year have narrowed it still more. This work was on exhibition in the Illinois agricultural exhibit at St. Louis, beginning with less than 8 per cent. of protein in 1896 and increasing to more than 14 per cent. in 1903. As I have already stated, the horny protein, the horny starch and the germ contain 80 per cent. of the gluten in a grain of corn; therefore, if we select corn which has a tendency to increase these components we can increase the protein. In the diagram to which I have already referred we see that in the high protein kernel the horny starch extends to the germ, whereas in the low protein kernel there is a layer of starch between it and the germ. It will be noticed on the analytical chart that the increase in protein in high protein corn over low protein corn is almost entirely in the horny part of the kernel. There is a slight increase in the germ also; therefore, if we increase these components we increase the protein. No chemical analysis is necessary to determine the amount of these components. The only instrument required is the farmer's pocket knife. Cut the kernel in two through the middle parallel with the flat side and you will readily see whether the horny part touches the germ or if there is any white starch between it and the horny part. If only a small quantity, you have a corn that has a tendency toward increasing the protein. Cut the grain again, beginning with the tip end, and shave it down gradually, observing carefully as you go along and you will see whether the starch layer remains along toward increasing the protein. Cut the grain again, beginning with the germ throughout the entire length of the kernel and you will

see how the protein increases as you go along. A chemical analysis of your specially selected seed corn will be of great service because you will know definitely what you have accomplished every year. The farmers have in their hands the key to the situation. They raise the kind of corn stalks they desire, the character of ear that will insure a high percentage of corn to the ear, the kind of kernel that will contain the kind of animal food needed. They can eliminate the barren stalk, the nubbin producer, the sucker producer, the ears that come too early or too late, or they can produce a corn adapted to climate, soil and the purpose it is intended to serve.

A Member: Professor, what kind of ripeness do you want to have when you take off your seed corn?

PROF. MENGES: I want to have it perfectly ripe.

MR. HOOVER: Professor, isn't it very essential that we have the corn fully matured in the field, and actually pick out the very best ears and mark them and select them for seed, and having done so, put them away in such a place where the temperature is uniform, out of the reach of rats or mice, and have them in the best possible condition in the spring, and in doing that, aren't you more likely to have the very best seed corn you can get?

PROF. MENGES: Yes, there is no doubt about that, and after you have made that selection, you want to go a little further. You want to select about twenty or thirty or forty ears of the very best corn that you have, and of those that are most similar to the corn that you want—those you want to plant in your breeding plat, and you don't want to plant any two ears in one row.

A Member: Side by side, Professor?

PROF. MENGES: Side by side, yes.

MR. WAYCHOFF: Professor, you have been holding up before all these people this afternoon a white ear of corn. I regret somewhat that that is true, but I want you to take this ear of corn (handing Prof. Menges an ear of yellow corn) and compare it with your ear of white corn, and tell us which is the best.

Prof. Menges took the two ears of corn, placed them together, and turned the butts toward the audience, with the remark that he would allow them to judge for themselves.

A Member: Professor, how close in the row would you plant that corn?

PROF. MENGES: Three and a half feet apart each way. That depends on the soil. If I have a good limestone soil, I might probably put three stalks to the hill.

A Member: Do you shell it all at the small end?

PROF. MENGES: No, I do not.

PROF. SURFACE: Professor, would you just break those two ears across, so that we may see how they compare? Let us see the cross sections.

PROF. MENGES: I would like to weigh these two ears of corn and shell them, and then you would get down to something definite.

A Member: Which has the most feed value?

PROF. MENGES: I haven't got to that point yet; I will take that up later, in its order.

MR. WAYCHOFF: In presenting those two ears of corn to this audience, to judge which is the best corn, you have only given them an opportunity to judge on one point and that was simply as to the butt end of the ears. Now is that a fair impression to leave with this audience, by giving them only an opportunity to judge from that one point?

PROF. MENGES: I did not judge it at all; I left it to the audience. In my estimation, that one point would gain my opinion.

The meeting adjourned to 7.30 P. M.

7.30 P. M., Thursday, May 25, 1905.

The meeting was called to order, with P. S. Fenstermaker, of Allentown, Pa., in the Chair.

The Committee on Fruit and Vegetables presented the following report:

We, the undersigned Committee appointed by the Secretary of Agriculture, Hon. N. B. Critchfield, to examine the fruit, vegetable and grain exhibit at the spring meeting of the State Board of Agriculture at West Chester, Pa., May 23 to 26, 1905, desire to submit the following report:

The apples exhibited were a plate of Stayman Wine Sap, grown by Dr. J. H. Funk, of Boyertown; Decker Seedling, grown by Henry W. Northup, of Glenburn; Langdorf Seedling and Gibbs, grown by J. B. Johnston, of New Wilmington. The apples were exceptionally fine and well preserved without cold storage. The quality of the Stayman Wine Sap is recognized as one of the leading apples in quality and is wonderfully adapted for Eastern Pennsylvania. The Decker Seedling is especially recommended as a promising new variety.

The corn that deserves special mention among the yellow varieties is, the Colossal, Hildreth Yellow, Dent and Riley Favorite, and among the white varieties, Boone County White, U. S. P. B. Selection No. 119 and Iowa Silver Mine.

Respectfully submitted,

J. H. FUNK,
J. H. LEDY,
Committee.

The CHAIRMAN: Is there any action to be taken on this report?

On motion, the report was adopted as read.

The CHAIRMAN: Before taking up the regular program, there is some time to answer questions on the papers of Mr. Schwarz, Prof. Watts and Prof. Menges. If any of the members desire to ask any questions in reference to any of these talks, if they will hand them up now, they will be answered.

DR. FUNK: Mr. Chairman, there have been a few questions handed in that were not handed in last evening, and there was no opportunity afforded during the day to answer them.

QUESTION: Is there any danger of the San José Scale attacking the forest trees?"

DR. FUNK: Well, I think beyond doubt there are certain varieties that will be attacked by the San José Scale. They seem to have a preference for certain varieties of trees, but then in case of their not having the opportunity of feeding upon those, there is special danger it seems to me that they may attack others.

QUESTION: "Why not make up a stock solution of the lime, salt and sulphur wash. You surely want it to last for several days or weeks on the trees?"

DR. FUNK: The reason we cannot do that is this: For instance, you make up to-day a lot of the solution and you want to use it to-morrow. The acid principle of the hydro-sulphate is thrown down in the form of a sulphur-like crystal and it is not efficient unless it is again reboiled, and it will take at least two hours before you can again reboil as required and get them into an acid form, so it is always advisable not to prepare more of it than you can use at once.

QUESTION: "Has Dr. Funk or any one in the audience any experience in spraying potatoes to prevent early and late blight? If so, what has been the result?"

DR. FUNK: I have had a good many years' experience in spraying for the blight, and with very satisfactory results. In fact, I have

never had a potato fail that has been thoroughly sprayed that has been affected by blight, either early or late. You can depend upon it that by using the Bordeaux Mixture No. 1 or the arsenite spraying, if you commence in time, to effectually prevent it. I commence spraying mine just as soon as you can see them; if you wish to prevent the blight, that is the time you must commence, before the spores are established on the plants.

MR. THURSTON: I would like to inquire if you have ever sprayed for the oyster shell bark louse?

DR. FUNK: I have never sprayed for the oyster shell bark louse with the lime, sulphur and salt, but I have sprayed for the San José Scale and I would consider the one just as hard to destroy as the other.

MR. JOHNSTON: Will Dr. Funk tell us what power he uses on his sprayer to give a uniform pressure of 120 pounds to the square inch?

DR. FUNK: I use a little gas apparatus; it is carbonic acid gas put into tubes, holding fifty pounds of the liquid. It is put in under a pressure of 1,800 to 2,000 pounds to the inch which condenses it into a liquid.

MR. SCHWARZ: Where do you obtain your power?

DR. FUNK: We own the tubes and send those tubes to Philadelphia to the Carbon-dioxide Company to be charged.

A Member: What is the size of the tube?

DR. FUNK: A 50 pound tube.

MR. BRINTON: How soon after planting should an apple orchard be sprayed?

DR. FUNK: I claim that all trees should be sprayed with lime, sulphur and salt. It will keep off all lichens, as I had illustrated this spring quite distinctly, in spraying some thirty acres in the spring of the year with lime, sulphur and salt. We cannot entirely rely upon the Bordeaux mixture.

Questions relating to poultry answered by Mr. Orr.

A Member: How do the Orpingtons compare with the Plymouth Rocks?

MR. ORR: They are from half a pound to a pound larger than the Plymouth Rocks and they develop quicker either into broilers or roasters or egg producers. As to egg production they are about the same, as to size or number of eggs; as to total qualities, I have always esteemed the Wyandottes better than the Plymouth Rocks, and the Orpingtons are better than the Wyandottes. I spoke to you

this afternoon in reference to the quality of the fibre and flavor of the flesh; as to broodiness, they are about the same.

MR. SEEDS: How do the white leghorns compare with the Plymouth Rocks?

MR. ORR: The white leghorn hen is the queen of New York for egg production, first, because they lay a white egg, and second because of their superior table qualities; the New York people are learning how to supply just what they want.

The CHAIRMAN: We shall now have the pleasure of listening to a lecture, which will be illustrated, on "The Horse," by Dr. Leonard Pearson, State Veterinarian, of Harrisburg, Pa.

(Note.—The lecture of Dr. Pearson consisted almost wholly in the exhibition of pictures thrown upon the screen, hence it is difficult to present even a synopsis of the address without the pictures.)

At the conclusion of Dr. Pearson's lecture, the next number on the program was taken up and the audience had the pleasure of listening to an illustrated lecture on "Birds and Insects," by Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

The following is a synopsis of the address:

BIRDS AND INSECTS.

BY H. A. SURFACE, *Economic Zoologist, and Professor of Zoology in the Pennsylvania State College.*

(This address was illustrated by a beautiful series of slides kindly loaned for the occasion by Messrs. Williams, Brown and Earle, of Philadelphia, and by others made by Prof. Surface and colored from life by Mrs. H. A. Surface. The address was given extemporaneously and with the characteristic enthusiasm of the speaker. The audience was intensely interested from beginning to end, and many questions were asked during the course of the address without materially interrupting the train of thought which was presented.)

The speaker illustrated representatives of all of our families of native birds, beginning with the aquatic or lower forms and ending with the thrushes. He spoke of their haunts and habits, and especially of the food, with particular reference to the kinds of insects which birds eat. He showed that while the wading birds live in damp places, and the plovers and killdeer in grassy pastures, eating the cutworms and other injurious insects that may occur in such regions, the Quail feeds mostly on the ground in dry regions, and the Meadow Lark feeds in open pastures and near the haunts of man,

especially eating grasshoppers. The Quail is a valuable bird, both as a destroyer of weed seeds and as an enemy of such injurious insects as the potato beetle. All farmers would be justified in protecting this bird on account of its great economic value. It should be furnished partial shelter and food during the time the snow is on the ground.

The speaker mentioned the fact that the Ruffed Grouse, also called Pheasant, endures our winters for the reason that it roosts in trees, and feeds on buds. Thus it is not often smothered with snow, and its food is available at all times during winter. He showed that different birds have different realms or regions in which to feed, as the Swallows skim over the waters and over grass and grain fields, taking insects as their food while flying, the Chimney Swifts fly higher and feed on the winged insects of the upper atmosphere, and the Night Hawks and Whip-poor-wills fly and feed at night when the larger insects are moving.

The Flickers, Catbirds, Robins and the Wrens live near the abode of man, and feed upon the insects of orchard, field and garden, while the Woodpeckers are constantly to be seen gathering grubs from the larger branches of trees and destroying codling moth and other serious pests. The Nuthatches and Creepers are searching beneath the bark of trees for pests there concealed, and the Chickadees and Kinglets are making a most careful search for pests on the smaller twigs of fruit and other trees. The Warblers are constantly busy in the tree tops, going even to the tops of the highest trees searching for the insects that there may be found. There is no place where pests occur that does not have some of these feathered friends making their home and exerting all their energies to take as food the insects that are most injurious to mankind.

The speaker then mentioned several obnoxious insects and the different kinds of birds that he and other investigators had found destroying them. Pictures of these insects and birds were shown and similarities and differences were indicated.

While there are many injurious insects that are eaten by birds, it is well known that there are many insects that are decidedly beneficial to mankind, and the question may well be asked if these insects are not also destroyed by the feathered songsters. The speaker took up this point in a very attractive manner showing pictures of beneficial insects and pointing out the fact that there are very few birds or reptiles that have ever been known to destroy these friends of the farmer and fruit grower. Among such friends he enumerated the Lady Beetles, the Lace-wing Flies, the Syrphus Flies, which feed on plant lice, the Ground Beetles, which are exceedingly numerous, but are not often eaten even by ground-haunting birds, the Honey Bees which are so valuable in fertilizing flowers, and the Bumble

Bees which are essential for the production of seed of red clover. The Scavenger Beetles are also important beneficial insects, as are the Burying Beetles, the ferocious Tiger Beetles, the predaceous True Bugs, and the egg parasites or Chalcids. All are important in aiding to hold in check others of their general class. However, it is very remarkable that by the most careful observation, birds have very rarely been seen to eat any of these beneficial insects, and very few of the latter indeed have been found in the stomachs of birds that have been examined by naturalists.

The audience was advised to study Nature carefully and learn to recognize and protect their friends as well as to detect and destroy their foes, and to learn the plan of Him who "doeth all things well."

The speaker was enthusiastically applauded and given many congratulations at the close of this evening's entertainment, which was one of the best that had ever been enjoyed by farmers' institute workers.

Adjourned until to-morrow morning at 9 o'clock.

Memorial Hall, West Chester, Pa.,
Friday, 9 A. M., May 26, 1905.

The meeting was called to order by C. B. Hege, Chairman, of Marion, Franklin county.

The CHAIRMAN: We shall now have the pleasure of listening to a song by Mr. H. H. Hall, of Potter county.

Mr. Hall then sang a song entitled "Dodging Our Way Through the World." (Applause.)

MR. LOCKWOOD: I would like to ask Prof. Menges if he has ever read a book—I have no doubt he has, as it is public document—relating to corn. This public document any of you are entitled to. Send to your member of Congress and if he don't get it, ask an **appropriation** for it, and print a million copies, and set the presses to work. The title of it is, "Argument on the Revised Patent Laws; Senate Miscellaneous Document No. 50, Second Series, 1878."

MR. HALL: (Handing a grain of corn to Prof. Menges.) Professor, I would like to inquire whether the grain of corn handed you is a protein grain of corn.

The Professor explained that to determine this accurately, a chemical analysis would be necessary.

A Member: I have ascertained by chemical analysis that some corn raised from the same seed under different conditions, varies in

a chemical test as high as one per cent. in different crops with the same seed.

PROF. MENGES: On the same soil?

A Member: Not exactly, but the relative crop is about the same; about ninety bushels in each case per acre.

PROF. MENGES: When I started out yesterday, I said that you should select a variety of corn from the corn that has been produced in your soil and your climate, and that is a great consideration; the soil and climate certainly have a great deal to do with it. Now if you have a corn that is grown in your soil and your climate, and there are ears on that corn that have increased the amount of protein that corn has adapted itself to those conditions, and then the hereditary tendency is adopted and consequently you can expect from that corn, in all probability, an increase of the protein.

I won't say that this is so. These things are in an elementary stage of development, and it will not do for a man to get up here and make positive assertions. If you have a high protein corn over in Illinois, and bring that over into Pennsylvania, expecting that it will produce the same thing here, you may be disappointed. No one can say positively that it will produce high protein corn in Pennsylvania, and why not? Why, because you have changed the conditions entirely.

MR. TEMPLE: We have here with us Mr. Henry Forsythe, one of our neighbors, who was glad to have had the privilege of opening this session. We should be glad if the chairman could grant to him a few moments.

MR. FORSYTHE: Mr. Chairman, I haven't anything very special to say in this matter except that I have been following the selection and breeding of corn to some extent for twenty years. I feel that not only is corn influenced by a particular soil, but in this section, our soil changes with a difference of only a few miles. In this particular case, which I raised the question about, it was the same corn subject to the same selection, and it had been about ten years on that soil, and in the other case about five years on the other soil. Originally it was the same, selected by the same party, and under the same relative conditions, and a crop almost the same, consequently it seemed to me the climatic condition had no weight in this particular case. Wouldn't that be so?

PROF. MENGES: I am not prepared to say yes or no. I suppose that there are conditions such as you have described that cannot be attributed to anything definite because we don't know anything definite.

MR. FORSYTHE: I thought it might be interesting in this case, because it was rather a hard proposition for me.

PROF. MENGES: I want to say further that when this general tendency which is in that ear of corn has been taken advantage of, the chances are always in favor of increasing that tendency, and it has been done in the State of Illinois, as I said, from a nutritive ration of one to fourteen or sixteen to one to eight, and in the last year they have narrowed that nutritive ration down from one to six in many instances; I had a letter from Prof. Hopkins in which that statement was made. According to the corn described by Mr. Forsythe, may I ask you whether you had that corn analyzed?

MR. FORSYTHE: I did; it was analyzed.

PROF. MENGES: Did you select an ear that had a tendency to produce an increase of protein?

MR. FORSYTHE: They were simply selected for a certain type of ear, but they were selected under the same conditions and by the same party in both cases.

PROF. MENGES: There are (exhibiting) two ears of corn of the same type; that one is developed for quantity, this one not so much so; that is more of the real type of the ear of corn that we have, and the protein in that ear of corn is a good bit larger than this in the same kind. You don't know whether you had ears that had a tendency to increase the protein or decrease it, did you?

MR. FORSYTHE: No, I couldn't say as to that.

PROF. MENGES: You didn't have that in view in the selection of the seed corn; examine that grain and then you will be able to determine.

The CHAIRMAN: We learned yesterday that the product of corn per acre in Pennsylvania was twenty-nine bushels, was it not?

PROF. MENGES: In 1903 it was thirty-one bushels.

The CHAIRMAN: Now why is this? I know people in Pennsylvania that don't think anything about raising less than a hundred bushels of corn per acre. Now is it in the seed selection, or is it because the land has lost its fertility that the average is so cut down? I believe that every acre of corn, even in a dry season, can be brought to average from eighty to a hundred bushels. I believe that I have ground prepared and planted in corn on my land, that if I get one or two rains, that I can grow a hundred bushels; it is the lack of cultivation in the ground.

MR. HERR: I think the gentleman must be talking about corn ears and not shelled corn; very few people ever grow a hundred bushels of shelled corn to the acre.

The CHAIRMAN: We will now have the first number on the program, which is an illustrated "Chalk Talk on the Dairy Cow," by J. D. Detrich, of West Chester, Pa.

Mr. Detrich spoke as follows:

CHALK TALK ON THE DAIRY COW.

BY J. D. DETRICH, *West Chester, Pa.*

Mr. Chairman: The whole human race have always been very much interested in the subject of production and reproduction, and if we were to characterize this age of agriculture, we would call this the age of breeding or of heredity. Whether it is the President of the United States, or whether it is any citizen who has passed away and done some noble service for his country, we are always ready to write up his biography. We to-day are so thoroughly convinced of the importance of selection for the purpose of advancing the interests of agriculture as well as breeding live-stock, that we have taken a very deep interest in the selection of those animals that will do the best and produce the best, and be of the most beautiful; and it is also a subject of important consideration to determine the profit to be derived from the pursuit of business along these lines. These things have been fundamental interests from the time of Plato. They have found their way to us through the universal human heart and mind and will continue to interest us for all time to come, whether we breed cattle, fowls, horses or plants, whether we view a landscape decked with beautiful flowers or enjoy the verdure of summer, as we look out over our fields.

The human mind has the power to perpetuate and order the growth of plant life or the conditions which govern animal life. The day will come when the laws of marriage will be much more stringent than they are at the present time, so that we may have fewer hospitals and insane institutions, and all these things which are now provided for the imperfect or diseased members of the human race. What is humanity going to come to unless we regulate the laws of marriage? No person wants to breed a lot of weaklings, and in order to avoid that, you must make the conditions such as to produce the best and those which live the longest.

We must learn to exercise the power of selection, as you have heard in the lectures of yesterday afternoon and evening, and likewise this morning. It is necessary even for the purpose of growing plants and corn crops, and as you have learned, it is a fact that we are commencing to breed corn, a thing that was not known of a few years ago; and when one turns his eye back to California and sees the work that Burbank has done with the wild cactus, for it is said that he has turned that into a fruit to-day, not only for man but for animals. It is wonderful what the human mind can do when it simply sits quietly down and takes up the laws of God, and studies them and follows out their teachings.

The work which Burbank has done is remarkable in every respect, and it seems that when we are down to the lower forms of life, we can handle them best, but that don't argue that we can't handle the higher forms. We will continue to go higher in our knowledge of all the laws of God. We will not stop simply with the plants that Burbank is handling, but we will push on; we are commencing to handle the animals to-day.

This subject appeals practically to me as a dairyman; it would be impossible for a man to succeed in the dairy business unless careful in the selection of his animals. You will never be able to attain to any real growth or progress without cultivating and developing your knowledge and your eye most carefully along the lines of improvement in the selection of animals, and then comes the question of care and feeding. I am not surprised that people quit breeding cattle; not at all. Could you take a soil deficient in potash and nitrogen and grow an animal as vigorous as the one that starts on the prairie? The cattle business is a wonderful business in the West. In those native soils that have never been touched with the plow, just touch them with the plow, and you soon see the cattle range disappear; there are not the elements in the soil to grow the bones desired in these animals. We speak to-day of knowing all these things because they have been tried. When I saw Sexton's big steer, the first time I saw it, I said, "Was this raised on this Montgomery farm?" He said, "You well know you could never start a steer like this on these wornout soils of Pennsylvania;" and he commenced to tell me how the animal was started on a prairie in the West.

These general laws have driven us to study and to investigate more closely into the conditions necessary for success in the dairy business, have taught us to observe the form and the conformation of the animal of which Dr. Pearson spoke last night. They are so necessary. Why? Because we believe that inward qualities are expressed in outward signs. Let a lady go into Wanamaker's store in Philadelphia to buy a garment. She judges by the texture and appearance; looks most carefully at it to find out how it is woven, and

the application of her judgment to these points will determine her purchase. It is the same way when you examine a building. You look at the material and the way it is put together, and when it comes to human life and animal life or plant life, you commence the examination, basing it upon the whole fibre, the structure and form, especially the form, to a very great extent; if that is carefully studied it will show you exactly what it is in the one and in the other. We will all admit the laws of physiology; that there is expressed in the countenance and in the form and in the general conformation as well as the line of ancestry back of it, certain tendencies, certain peculiarities which identify themselves with a particular family. You will admit that these things express inner qualities which you can perpetuate and hand down in a uniform way. If you could make a selection of the best of these qualities and hand them down, it would be a great benefit to civilization and to yourselves. At first I knew nothing at all about the laws of breeding. When I found out that I had a valuable animal that produced a fine calf, I considered that I had something to build up to.

I have learned that we must work on this basis; there must be a careful selection of sires, for that is the true line of breeding. You have but one sire, and you must look to your sire for the improvement of your herd. If in some one instance the dam has more influence than the sire, it will be found after all that it will be to your advantage to especially look to the sire. When animals are selected for the race track, it is the sire that brings out the qualities desired, and it is the sire that brings the thousands of dollars which we read of. It is very seldom the dam is sold for so much as the sire. If the sire has the ability to transmit and goes into a herd, he is able to impress his prepotency and his qualities upon that herd in such a way that the whole herd is built up, and the improvement is commenced then and there. The question sometimes arises, should that sire ever be killed or slaughtered, because he is cross or ill-tempered? Or should he be killed because he is getting old? I say no, that sire should be handed from farm to farm until natural laws take him away.

In dealing with the subject of breeding, one of the most important questions, we always start with a calf that has a good ancestry back of it. Let us take a line of ancestry that we know to be good. The first thing to look at in ancestry is the constitution. While I endorse every word said about inbreeding, I want to say to you that it is one of the most delicate things imaginable in practice. A man should not imagine that he can go into the business of inbreeding because he has paid so much for a sire and so much for a dam. It requires the nicest observation, it requires years of experience for a man to know when to inbreed; I tried it to my own satisfaction, and

made a most miserable failure and mistake at it. We have to handle these laws most carefully and knowingly. When we think of what Burbank does, we can see the difficulties surrounding the question. There are hundreds of thousands of plants that he raises, and his great eye goes over that great growth and simply selects out one or two which he bases his work of development along certain lines, and for the purpose of reaching certain results and to accomplish such results, it needs anxious care and observation. As it is with the plant, so it is with the animal; therefore, in order to make it a profitable business, if we want to succeed, we must start with the animal in such a way that we breed the animal right.

We will start with a thoroughbred. If a man wants to improve his herd of cattle, he can do it through the sires. Any person can improve his herd of cattle to-day by bringing in a thoroughbred into the common herd. It is a slower way to do it, but it is a successful way. We can learn along these lines how to accomplish results. Then another thing, we must learn that we must take just as good care of the soil as we do of the animal. While many persons disagree with Prof. Cooke about the fertility of the soil, I would endorse that foundationally. You must have the three elements in your soil. You can fatten plants just as well as you can fatten animals. You can get more protein into your plants if you have it in your soil, and get more phosphoric acid if you have it in your soil, with hay and grain from your soil that is rich in these qualities. You don't know when the rain is going to come; you must have it there so that if these conditions are favorable, nature will take it up, because there is an abundant supply. I am not talking about the renter and the landlord, but about honorable farming. Where a man is in touch with God's earth, he is responsible to his Heavenly Father, as a steward of his possessions. Farming is taking this earth where God has breathed into it this life and fertility, and if the robber man steals it out and then accuses the Almighty for making the earth so poor, there is no greed more to be pitied than that of a man who so little regards his obligations to his race and so recklessly esteems his relations to the creative work of his Heavenly Father.

When you see the rich fields in the prairies of the West ladened with every kind of element to make the plant grow, see the earth in its richness and its fruit, and realize what the hand of the Maker has done, and then look at your own State and see what has been done by the hand of man, you can see very well that it is man's own disposition of taking something and giving nothing, which has brought about the existing conditions, and which you know is the worst kind of business to do, and the method is comparable only to that of those animals that make their living by stealing. The ex-

ample that you should have is, to take these elements that God has given so richly to the earth for the feeding of the plant and the growing of the animal, and apply them in the wisest and best way according to his wonderful laws.

It is this system that has made Flouertown, that has made it known in the eyes of its friends as well as its enemies. They had to admit it was there. When you went into the dairy room, you saw sleek animals with full udders and health in every face, and could not fail to recognize that every animal was bred for the purposes of the dairy. We discarded all the animals bought for \$25 and \$30 and we took thoroughbreds and commenced to bestow a great deal more labor and care upon them; commenced to examine and select the calves, and in doing this as we learned from the Island of Jersey, the calf was turned over on its back, and carefully examined. We watched the depths of the animal's ribs; observed whether the legs were short; noted the shape of the head, the contact of the upper lip; put our finger between the last rib to see whether there was space there so that the animal could take in fat. We looked at the whole structure of it, to see whether the animal was good enough to keep, or whether it was useful only for chicken food. The more careful we were in selecting these animals, the better returns we got for them. We watched them carefully from the moment a calf was dropped until it went into the dairy.

There are some little things that will come up that will have to be considered and acted upon. It is a question with me whether a calf ought to have a protein feed, as is usually spoken of in our dairy institutes. Take, for instance, the case of children. For the first few years of the existence of a child, it ought to be fat and plump, and in order to produce this condition, you give the child milk and sugar to make it grow. Now what applies to the child will apply to the animal. When you come to the other side of the animal, we try to give it skim milk to grow the bones and muscles, and in addition to the skim milk there are several things we ought to add; we ought to add a little more carbohydrates to the food of a calf. I have noticed in those calves that would take on a good strong shoulder in the first eighteen months of their lives, those animals were the strongest working calves in the dairy herd. I have tried the plan of giving them skim milk and bran to keep the animal in the required condition.

The doctrine taught a few years ago was that a heifer was to have no corn meal at all, and that she was better for not having any ensilage; that clover, hay and bran and linseed was the correct thing in the way of feed. When you keep that skinny outline and keep the bones growing, there is something about carbohydrate feeding that is necessary for the young animal. It seems to come along with

a better form, get more vigor, and stronger constitution in feeding that way. Now the very advantage that we got from the feeding of so much protein and so much skim milk, we found made a big difference in the dairy herd. About three or four months from calving you commence to see the shoulder dropping off and commence to take on the dairy form, and shape up for her motherhood, and considerably more vigorous than when brought up on the protein feed. That is our experience in regard to the matter. When we came to develop the udder of these heifers, it was a very nice thing to do. We have had but one sire in all our history at Flouertown that could put an udder upon everything with which he came in contact. We were certainly assured that that animal would bring such a result every time. Now every one of his heifers showed up splendidly as well as in productiveness. There are certain things about the udder that we want to think about. Our doctrine is, no udder, no cow.

Now there are three ideas that must be kept constantly in view in breeding. I believe that a man who takes an animal and breeds an animal up to a state of perfection and beauty, is just as great an artist as Beethoven or Mozart, or any artist that undertakes to take material of clay and model a statue or paint a picture, for he develops it just as carnations have been developed. We are looking at these questions because we know that from like comes like, and we must learn to follow Nature's laws and work along the lines that experiment has shown will bring the required result. We can see that in the bare form; certain indications that show what an animal is going to be. Suppose we take up the question of that heifer that we turn over on its back. We examine its mouth and eye, note the shape of the neck, the line of its back, the angle of the form along here (indicating on black-board). All these are splendid things, but suppose the animal has a beautiful form, and she has no line of udder, when it is eighteen months old; when you stand on a side view, find you cannot see one of the front teats. It is a pity that such is the fact, for you have made a mistake and it is a pity that you have not bred better. In the dairy animal you must have that conformation in such a way that you can get out of it its best qualities. You know that the milk secretion is there and if there is not room to hold it, you are going to get into trouble about it. If you have an equally developed quarter, and those teats are just the right shape, so that a man can take hold of them and milk them very well and easily without squeezing the glands hard, then you have what you want. Time and again I have read in the dairy papers, something like this: "One of our cows don't give milk out of one of her teats." The officials will say, perhaps, the man has been milking that one teat too hard; he has closed up the inside of that gland by squeezing it too hard. Those are the things that render cows valueless time and again.

(Mr. Detrich made quite a lengthy explanation from a chalk diagram on a large black-board of the conformation which he regarded as best in a dairy cow. He drew a number of lines indicating good and bad conformation, and described in terms that could only be misunderstood by those viewing the diagram, the essential requisites to be sought for in the make-up and bodily organization of a successful dairy cow.)

If a man has a poor cow, it is not the cow's fault; it is the breeder's fault, for we can correct any faults that may exist simply by the laws of selection, just as we correct the corn and breed it for the purpose for which we want it. If we want a food breed, that is one thing; if we want dairy breeds, that is another. Therefore we must conform to the lines which are productive of milk and butter, if we want to succeed in the dairy business, and if we want beef, we must conform to the lines that are necessary for success for that purpose.

Now if we take up the feeding of the animal again, there is no doubt a balanced ration will be of very much advantage in handling our dairy herd, yet what folly to follow that to extremes. It will not do to just say, here is the book and here is the arithmetic. As far as figures and proofs go, it is very easy to cipher it out, but what does the cow's digestive system say about your arithmetic? There comes a question for you to settle again. A man must be just like an engineer who has his hand on the throttle, that directs the locomotive, when to go and when to stop. There must be no guesswork about it. The dairyman must have that knowledge in order to succeed, and if he has not got that knowledge, he must learn it. He must read the very best books in order to come in contact with it, and beside that, his own personal observation must be continued and constantly directed to enlarging his knowledge, and he must profit by his experience.

There is nothing that has helped the dairy business so much to-day as photography. I have a portfolio in which I have preserved pictures of the great sires and great dams from the time I first took up the handling of a dairy in Flourtown. I wouldn't take anything for that portfolio to-day. By means of it I can compare the great sires and the great dams. It is astonishing to note the uniformity of the lines which they show. Of course there is a difference in them, but you can distinguish their individuality. There is a uniformity of lines in these animals that is something very remarkable. The line of the back should be long and level, like this (indicating by drawing a line on the figure of a cow on the blackboard.) You can see that there is plenty of room for the maternity of the animal. An animal should have an abundance of room in here (indicating).

It is the same way with the conformation as we come down to the udder, drawing that line in this form (indicating on blackboard); that is the way that the dairy animal should stand, while the beef animal will turn right out the other way, and then come in and add it on in this way, for the beef animal instead of being cut out for butter in that way, you have the udder just coming right out in this form. This side of the animal starts down slender here, swells a little in this line, and grows up in this angular form; the udder comes swinging around in this form (indicating) and every man will notice when a cow has had her third calf, her udder will just come down just a little bit above her knees and her teats will reach just a little below the knee, coming down in that way (indicating on blackboard).

(Mr. Detrich made quite a lengthy explanation wholly with reference to a diagram of a cow on the blackboard which, because of its character and relation to the diagram, had to be omitted, for the reason that without the diagram, it would not be intelligible.)

The head is just as important in a dairy animal as it is in people. If the animal has not got a good head, you don't want it; and you also want a real good jaw.

(Mr. Detrich traced the lines of head and jaw as he conceived they ought to be.)

Unless we sit down and study the figures of animals along the particular lines that we are dealing with in our breeding, we shall never make any progress because we shall not have the necessary data to work from. We must know what we are after and breed accordingly, and how can we select unless we know what we are after.

In the New Jersey Bulletin—the last issue—you can see the cut of the son of Tudor; I wish every one present could examine that. I never saw as fine a head, as fine fore-shoulders, nor a better fore-arm on an animal in my life. I hope you will look at it carefully. You want a bull to be masculine, but you never want him to be coarse. A bull ought to have a crest that is high; the head of the sire should be high, but yet not coarse. There should be no coarseness about it. The hindquarters of the sire should be exactly like the hindquarters of the dam. The dam throws her hindquarters on the son, and the sire throws his hindquarters on the heifer. This law holds wonderfully well in scientific breeding. These laws hold very much more permanently than we are inclined to believe.

You sit down and cut from the newspapers all the different ani-

imals that you see. Take the figures and commence to study them and look at the records which are given with them to-day, and you will see just what constitutes the type and form and that is being done to-day for the science of breeding. I thank you for your attention.

Questions and Answers.

MR. STOUT: I would like to ask whether there is anything like a general purpose cow?

MR. DETRICH: I never met her and I never studied her.

A Member: One point I hope has been impressed upon this audience, referred to by Dr. Detrich, and that was in the selection of the male. That is one of the most important points in breeding cattle particularly. I agree with the Doctor when he said that the sire, through the dam, conveys to his heifers the milk and butter qualities; is that correct?

MR. DETRICH: Yes, that is correct.

A Member: You spoke of the carbohydrate feeding for the calves. Did I understand you to advocate that?

MR. DETRICH: The carbohydrate feeding for the young calf, I think is very much like a child. You know children crave for sugar and they want, and must have it. They are always plump and fat, and all that fat will after a while leave. I have noticed the very same thing in the dairy animal; you know our physical organizations are not so very dissimilar. I find that the young really ought to have more carbohydrates than we are inclined to feed them.

MR. MARTIN: Did you ever have trouble with milk fever?

MR. DETRICH: I never had milk fever but once or twice in all our history in dairying; milk fever comes from improper feeding, or from exposure and improper feeding.

You know the custom at Flourtown was not to let a dairy animal run at large. We take the food to her and give it to her in such a balanced ration that we could get the very best results, therefore, we stabled the animals almost continuously. The only time we let a cow out was when she was dry, and then we made her go out and stirred her around and gave her plenty of exercise.

We are getting more and more to live under roof, and we must make provisions accordingly. I have found out that a dairy cow for 365 days in the year, if she gets the care, the attention and the necessary light, and the necessary support, she will do the work,

but you must make that provision for her, and therefore you must watch her at every stage. If she is approaching the time when you expect her to give birth to a calf, if you keep on feeding her as when she was fresh in milk, you will ruin your cow. I don't know when I have sent a man out with a bucket of hot water to sponge a dairy cow; we don't ever bother with that; we watch the cow while she is making her udder, and we always try to make a cow go dry at least four weeks before she becomes fresh, and as soon as she is dry we give her timothy hay and water. We found that was the best in our artificial way of handling the cattle, and what is there to-day that is worth anything that is not artificial? We get the most out of them that is possible when we do our duty to them. We should be very careful to see that the cow is thoroughly dry, so that you cannot get a drop of milk from her. If you leave the least bit of milk in the udder, you are almost sure to have garget or some disease when your cow comes in fresh. We should be sure to have her thoroughly dry. Then we commence to prepare her for maternity. If we think she is putting on fat too fast, we keep her on bran and hay and if we find that she is not making an udder ten days before she should be fresh—we count 285 days for the period—and then we take care of the cow ten days before she is fresh; we watch her carefully and notice whether she is making an udder. If not, we give her a handful of linseed meal with the bran, and if she does not make an udder in six or eight days, we increase it—give her a little more linseed meal, until we will bring her up to a pint or a pint and a half of linseed meal if necessary, or to even a quart. There must be an udder; we have got to have an udder. Her bowels must be in a good, loose condition; just as long as the cow is fresh we use so much creolin and so much water. We rub the cow off with some brushes and put the calf away in blankets and then give the cow one quart of bran and two or three quarts of cold water several times a day. If you give a cow all the cold water she wants, it will make her bag as hard as a brick, but if you give her cold water as stated, there will not be any trouble; the bag will not get hard. We gradually increase the feed.

MR. ORR: Doctor, do you object to telling us what you mean to do with those fifty-five cows we saw the other day at Mr. Kates' farm?

MR. DETRICH: We have made no calculations on breeding those cattle. They were simply picked up in New York. We will never breed these cattle. I would not be bothered with such cattle, gentlemen. You have got to reduce breeding to a science; you must reduce it to a science as you reduce feeding to a science. You must use it to such an extent as to simplify matters and keep you in the

right direction. We should not think of breeding from those cows we have out there now; there is nothing in it; thoroughbreds are not any too good for us.

A Member: Of what value is the milk escutcheon as the means of judging that in the cow?

MR. DETRICH: I think it looks pretty.

MR. LOCKWOOD: What do you consider the best breed for beef?

MR. DETRICH: The Polled Angus is the most rapid and productive.

A Member: I believe that Dr. Detrich can do us yet a whole lot more good by giving us an explanation of the new cure for milk fever.

MR. DETRICH: I think you all know what the treatment is; I have no occasion to use it. The milk fever comes from feeding and not enough exercise; that is what causes it. I would take a cow and put her right down to exercise if I thought there was any danger of milk fever.

MR. CLARK: Are you able to offer any suggestion at all in reference to controlling the sex or calf?

MR. DETRICH: No, we don't know that.

A Member: I would still like to have a further explanation as to the treatment for milk fever.

MR. DETRICH: You can just send on to some of these men in Philadelphia, who furnish the oxygen treatment for milk fever. It is simply a question of oxygen, and it is provided with a rubber tube, a milk tube, and you disinfect these before using them. You put this right into the teat and put this gas into it. Sometimes ones of these treatment's is sufficient for a cow. It is seldom that they need more than one treatment. It is simply a little thing designed to be put here into the udder. One man says that if some of these farmers who are such good blowers will just get a quill and blow the cow full of wind, he will be all right.

The CHAIRMAN: We will now take up No. 2 on the program, entitled "What Shall We Teach?" by J. H. Peachey, of Belleville, Pa.

Mr. Peachey then read his paper as follows:

WHAT SHALL WE TEACH?

BY J. H. PEACHEY, *Belleville, Pa.*

This question is not a new one. It has troubled the mind of man from the fall of Adam until the present day. The truths of to-day

have been the doubts of to-morrow. All along the shores of time are the wrecks and ruins of inflated thought and false ideas. The accumulated years are freighted with wrong conclusions. Two forces—the one elevating, consistent and reliable, the other strange, fascinating and ephemeral, have ever contended for the mastery. Frequently the latter, gaining momentary ascendancy, would dominate for a season, but eventually the former, because embodying the underlying principles of fact, would predominate, proving the saying “that truth is mighty and shall prevail.”

But the voices of history teach us that the American people cannot at all times wait on the truth. Truth apparently travels too slowly for them. With this strenuous, intensified life it is difficult to abide the issue, to await the results, to prove all things and hold fast that which is good.

But what shall we teach? Some one says, “Teach what we know.” True it is, no one can teach more than he knows. But what does he know? We know that thought must precede action. That before the accomplishment of any enterprise there must be a plan, a purpose, or an ideal. This is called theory. The development of the idea is the practical; the one the counterpart of the other, useless the one, without the other. Why then should either be ignored? Is it good teaching to speak disparagingly of either, or to credit the one at the expense of the other. It is like two men disputing concerning the pronunciation of a word. The first said it is either, the second said it is neither, and the Irishman said, both wrong, it is “nayther.”

Good teaching then must necessarily admit both theory and practice. Happy is the man, the student of nature, whose originality of thought and action has created an ideal, and by careful investigation and persistent effort has developed the idea until, as a result of his labors, he gathers forth fruit an hundred fold. Whether this be done in field, farm, orchard or garden the same fond feeling should result therefrom. Such an one is prepared for his calling. Such an one comes before his audience with arms filled with truth, ready to disseminate valuable information, fitted to awaken thought in the minds of others. To teach others how to think by giving them something to think about is one great essential in teaching. Seeing and thinking are after all the great sources of information. In what other manner, or by what other means do we acquire knowledge? Our teaching them must appeal to the eye, the imagination, the mind, in order to be effective. Must inspire others with a desire for a higher purpose in life. Must develop thought for the accomplishment of those aims that make life worth living.

A lady entering a large department store was approached by the floorwalker, whose bended extremities resembled a parenthesis. The

lady inquiring for certain goods, was requested by the employe, "To walk this way." Misunderstanding the request, she replied, "I won't if you kill me." And thus we can not all walk alike. Neither can we teach alike. We can not do successful work by being imitators. Each must teach what he is qualified to teach, by putting his individuality into the work, by being himself. This, like beauty, is applicable to all. It affords opportunity for the experimenter to recount his successes or to enlarge on his failures. For the practical farmer to unbutton his eloquence in expatiating upon the manner in which that old desert of a farm, so poor and so dead, that the thunder's diapason long since ceased to produce a sound thereon, now teems with life, and energy, and bacteria, and increased crops, some forty, some sixty, some an hundred fold; for the dairyman to pay tribute to his favorite breed, establish iron-clad rules for feeding, and in story and song tell how to quiet the suspicions of the nervous cow; for the orchardist to sing the bass solo, "Spraying made easy," illustrating the relations existing between the Ben Davis, the turnip and the native apple, also extolling the good qualities of the York Imperial and Keiffer; for the market gardener to grow eloquent on quality and quantity, both being products of brains, water and sunshine; for the scientific fellow whose advanced thought and efficient service is too frequently the subject of ridicule and misrepresentation, to prove that the truths of the laboratory pertaining to agriculture are but interpretation of nature. The true investigator along these lines to-day is the farmer's best friend. And yet there are limitations to his investigations. There are points beyond which he cannot go, problems only partially solved; things that he dare not say because the statements have not been verified, although he believes them to be true.

It is a lamentable fact also that the spirit of cannibalism has grasped an ideal product of a scientific mind, as well as by advertising and the pockets of farmers. What they will secure in return for the investment can only be conjectured. Whether the increased size of the nodules on the clover plant will have "value received" stamped thereon will no doubt appear in the forthcoming testimonials. If soil inoculation meets the claims made by some writers and correspondents, our teaching will necessarily be more limited and a number of subjects can be eliminated from the bulletin.

An Englishman and an Irishman were employed by the captain of a vessel. The Englishman was hired without recommendations, but the Irishman was required to furnish satisfactory evidence of character and workmanship. The first job was scrubbing the deck. The Englishman was pulling the water with rope and bucket, the Irishman following with the mop. The vessel giving an unexpected lurch the Englishman went overboard, and the Irishman

was delighted. He went straightway to the captain and says: "Captain, the other day you hired an Englishman without recommendation, but me you compelled to furnish papers. Do you know what that fellow has done?" "No, Pat, I don't know." "Well, he's gone off wid your buckit."

Thus it seems that there is danger in placing too much confidence in men, as well as in that which they represent. The disposition to believe in slight evidence, or take things for granted, frequently results in loss. Recommendations and testimonials may bear false witness or deviate just enough to betray confidence. In the matter of soil improvement the good old way our fathers trod has been productive of good results. It is yet preferable to the "get rich quick" idea so indiscriminately advertised. Manure, legumes, lime when needed, fertilizers intelligently used, will help create in the soil the new life needed to produce crops for the present, allowing the scientist opportunity to develop more the principle of nitro-culture. We can afford to wait just a little longer; apparently no danger of famine in the land.

Another principle in successful teaching, is to teach what to do, and how to do it, rather than what not to do. A mother on leaving home told her children, "Now when I am away don't put beans in your noses." And the first thing the children did was to put beans in their noses. Had the mother failed to mention the matter the children would not have thought of it.

I remember clearly the "dents" one of my teachers employed; almost one for every minute in the day. Some of them were new wrinkles to us and naturally and good naturedly we wished to experiment with them. These experiments invariably caused trouble.

The surest way is to teach the rule, the principle, the means to be employed. Every rule, however, has exceptions. Whenever the exceptions become more general than the rule, then the exceptions become the rule. This direct teaching also economizes time. It is also more logical and more easily remembered.

Appealing more directly to our question, there are three things worthy of particular mention. They are essential factors in the problem and always applicable. The home, the school and the soil should first be considered. I mention them in the order of their importance, believing that these three, including their proper limitations, complete the list of subjects. They are so closely allied that, like the hues of the rainbow, one can not be removed without destroying the symmetry of the whole.

Concerning the home, it should mean more than a place to stay. If it does not mean more than that, some of the qualities of mind and heart that make life worth living are yet in an uncultivated state. If the country store, the grocery, the village, the street has

more attractions for the young than has the home, then either the home-maker or the home-keeper, or both, have not fully realized the value of a life. If the home has not instilled into the youthful mind that kindly remembrance, that grows larger as the years accumulate, and lives in the thought of it being the dearest and best spot on earth, then it has not reached the higher and highest principle of home life.

Wealth alone cannot acquire it. It will assist in making the comforts and conveniences. Beautiful structure, fine location, attractive surroundings, will not alone bring the results. Something more is needed to build a good home. No home, that is not a happy one, is a good one.

I knew a little boy in school, coming from well-to-do-people. It was cruel winter. The little fellow was poorly clad. While he stood shivering at the stove, his teacher asked why his father did not buy him better clothing. The little fellow said, "Papa needs the money to put in bank." Sometimes the real comforts of life are neglected. Too frequently we do not do as well as we know. Practice becomes easy because of habit. Occasionally we forget.

It is our duty then to assist in making better homes. To secure more of the modern conveniences and comforts; to look carefully after the health of the farmer's family. Much is said concerning the labor problem. We must adapt ourselves to the circumstances and condition. Better houses, equipped with more of the modern conveniences will, in part, solve the labor problem, because it will lighten labor and shorten hours. When this is done part of the difficulty in securing help will be removed. Part of the so-called drudgery will be displaced by more systematic work, the result of higher thinking. Thought must come to the rescue here as in all things else. So much has been said concerning the school that perhaps nothing new can be offered. In some respects we have been progressing; in others we have not kept up with the procession. Many disinterested persons still regulate the affairs of the school; as a rule they represent their constituents. In most instances the officers are very much like the people who elect them. Some school officers remind me of the Egyptian mummies, whose bodies are in the present—their souls are in the past. Our manner of selecting teachers has changed but little. We still employ young men and young women, who remain with us until qualified to teach, then genius goes where the money flows and we employ another. Our schools make experiment stations for town and city; preparing teachers rather than educating the children. Can we, interested in rural life as we should be, afford it? Can we expect good results from such a system? How long shall it continue? Who shall work a change? All along the line there are individuals pleading for

better educational advantages. In some localities their influence apparently is unfelt, while in others the colleges and academies have left an impress upon the people that is quite perceptible. It is a noticeable feature of their institutes. This is encouraging. It is satisfactory and conclusive evidence that education, adapted to the needs of rural people, is highly essential for the continuing development of agriculture.

To this end the farmer must evidently assume the responsibility of leadership. No one else is particularly interested. He must insist upon such changes in education as will better prepare the present and future generation for their life work. In this respect he dare not be entirely limited by the practical alone. The ultimate end of education is a trained mind.

The ideal in education is to learn to do things right. 'Tis said that when Princeton and West Point were lined up for the great game of football, the referee said, "Princeton are you ready?" The answer came, "Yep." "West Point are you ready?" "We are ready, sir," came the complete answer. West Point had learned to do things right. Fact is, the military and naval cadet is only allowed to do things right. He cannot evade it. He must live near the ideal. This principle in education was fully exemplified in the Spanish-American war. "The man behind the gun" had learned to do things right.

This principle can be applied in the home, the school and upon the soil. What a wonderful effect it can produce in all three. Nothing is so expensive as something poorly done. This is applicable to every business or industry. Nowhere does it have a more visible effect than upon the soil. And yet, when properly and intelligently treated there is practically no limit to its productivity. This has been clearly demonstrated in many instances and in various ways. And wherever nature's ways were allowed to regulate the course, the results have been better and more lasting. Wherever nature's laws have been violated the ultimate results have proved disastrous. In teaching then, study and follow nature along all the various lines of farm operations, applying the best methods of successful practice, in connection with the best scientific instruction obtainable.

It has been said that there are but three sources of wealth, brains, muscle and raw material. These three are dependent upon each other. If virgin soil is raw material, and the records are entirely trustworthy, then it has required less brains and muscle to extract wealth from the soil in the past than at present. It is also stated that the soil no more responds to the action of the farmer as it once did—that some of the crops grown in the past can no more be

grown successfully in some localities. If this be true then some one has not been treating the raw material intelligently. Brains has not directed muscle in the right manner. Nature has said "Thus far shalt thou go and no further." Here then is the turning point.

Therefore we teach of the home, the school and the soil. Without good homes, the school can not be supplied with good children, or good teachers, and the brains required to work intelligently and successfully with that intricate and poorly understood matter, the soil, will not be sufficiently developed to meet the demands of the age in which we live. The future farmer should be better than his father. If not, both are failures. The one is a failure because he has not instilled into that youthful mind the thoughts and principles for which he has lived. The other is a failure because he has not embraced the opportunity of enlarging upon the possibilities of the future.

'Tis ours to dignify and elevate our calling by carefully guarding and protecting our interests, rather than allow disinterested parties to direct our affairs, remembering that the hope of agriculture lies in the home and the school.

The following paper, as per program, was presented by Prof. Watson:

FEEDING SWINE.

BY PROF. G. C. WATSON, *State College, Pa.*

Swine have been known to exist, both in Europe and in Africa, since very early times. Some bits of early history mention swine, but do not give any clue as to origin or history of domestication. While a species of wild hog is found in this country, yet it is not thought that the domestic swine came from this species. Naturalists and others hold that the wild swine have descended from the wild hogs of Europe and Asia. The mingling of the blood of these two species, which represent distinct types, have produced the various breeds of improved domestic swine of to-day. Marked changes have been made in producing the domesticated swine of to-day from their wild progenitors. Man is responsible for the great change that has been wrought in transforming the narrow-bodied, long-legged, swift-footed animal of the forest to the compact-bodied, quiet, peaceful animal of domestication. He has created an organization whose energies are expended in an entirely different direction from those of the wild stock. In nature, the energies of the swine were largely, if not wholly, expended in seeking food for sustenance and in propagating the species. In domes-

tication, man, through a liberal provider of food, has been able to divert the energies, as expended in the wild hog, to the production of the most desired food products for his use. The improved breeds of swine of to-day are no longer required to seek food for the preservation of life. The expression "root hog or die" has been entirely obliterated from the pages of the guide-book used for economic meat production. Man provides that which the wild animal perforce must seek for itself. In making this provision, the nature of the organization has been completely changed, not only with reference to the production of flesh, but also as to breeding qualities. Domestic swine bring forth young more abundantly than do the wild species from which they have descended. They not only breed with greater frequency, but bring forth larger numbers at one time. The wild hog gives birth to few at a time and protects them until they are one or two years of age, while the domesticated swine may produce two or three litters in one year.

In directing the energies of the organization more largely toward the production of those products which man most desires, the organization has also been changed as regards the amount of food that it is able to digest and assimilate. As we study the development of the improved swine as best we may, we see that the amount of flesh produced is not the only marked improvement, but that its production is at the expense of relatively decreased amount of food. It is undoubtedly true that the quality of food has also been very much improved, but the total amount required has been decreased to a marked degree.

To briefly sum up man's endeavors in the production of these animals, which we may for convenience designate as meat producers, we may say he has succeeded admirably in producing more at a less cost. If we are to judge of the future by what has already been done, we may confidently expect that greater strides will be made in this direction. We hope and sincerely believe that the limit has not yet been reached. The great improvement that has been made with swine is comparatively recent. While hogs have been bred by man since the earliest history, improvement was not first made with swine, but with other classes of live stock. Horses, sheep and cattle were all improved before there had been much change in swine. Both sheep and cattle were greatly improved through selection and feeding, and without the introduction of the blood of alien breeds or types. Not so with swine. The great improvement came after the blood of different types was commingled. Relatively speaking, we may consider the improvement of swine as of recent date.

As man lessens the effort imposed upon the animal to seek sustenance, to that extent is he able to divert greater energies towards

the formation of those parts which are most highly prized. By selection and skill in breeding, he has also relatively increased the proportion of the most desirable parts. Not only is the amount of meat produced from a given quantity of food greatly increased, but its quality or value is also greatly enhanced.

It is my thought to discuss with you, if possible, one phase of economical meat production in swine; namely, the relationship between age and growth, or age and meat production from food consumed. It has been long known that the young of domestic animals make relatively a much more rapid growth than do those animals which are further advanced in their life's history, but not until quite recent times have accurate data been determined with a sufficiently large number of animals to give us anything like a general law or principle. Since the establishment of the Federal Experiment Stations, in 1887, numerous experiments have been made, which enable us to determine in advance the average development of a considerable number of animals with a marked degree of certainty.

A few years ago, Professor Henry, Director of the Wisconsin Experiment Station, gathered together the results of American Experiment Stations which pertained to the feeding of pigs at various ages, and averaged those that were comparable and tabulated the results. From these results, which were gathered from widely differing sources and made with a large number of animals, it is shown that pigs during the first seven days after birth gain about seventy-six per cent. of their total weight. During the third week, about forty per cent. During the fifth week, about twenty-five per cent. During the seventh week, about twenty-two per cent. During the ninth week, about nineteen per cent. While the decrease in percentage gain, as the birth period is receded from, is fairly constant, yet it does not decrease in proportion to the increase in total weight, or as the age of the animal increases. That is, the percentage increase in weight is most rapid immediately after birth. This grows rapidly less for a few weeks and then more gradually less and less until a time or period is reached when there is no further gain. From experiments made with hundreds of older animals, the percentage increase in weight has been quite accurately determined for average good conditions under which swine are usually kept.

Pigs weighing thirty-eight and one-half pounds a piece showed an increase of sixteen per cent. in one week; those weighing seventy-eight pounds, an increase of seven per cent.; of one hundred and twenty-eight pounds, six per cent.; of two hundred and seventy-one pounds, three and eight-tenths per cent.; of three hundred and twenty pounds, three and one-tenth per cent. These tests were made by a number of Experiment Stations and with hundreds of animals. Some of the averages were determined from more than a hundred trials

or experiments. This data, taken as it is from so many trials made in different parts of the country, should give us a safe means of estimating what we may expect from approved modern treatment and good average conditions. While the older animals do not make nearly so great a percentage increase as do the very young ones, yet their gain is so much greater than that of animals approaching maturity that the economical pig feeder cannot afford to ignore the question of age when he is selecting stock for his feeding pens. When we compare the amount of food required to produce a pound of gain in live weight at the different ages, we find the comparison almost as striking. With pigs weighing thirty-eight pounds a piece, about three pounds of feed were required to produce one pound of increase in live weight. At seventy-eight pounds of weight, four pounds of feed were required to produce one pound of live weight. At three hundred and twenty pounds of weight, a little over five and one-third pounds of feed were required to produce a pound of increase. Here again it is shown that older animals do not turn the food which they consume to so good an account as do the younger ones. While it is true that as the pigs grew older they consumed much less food per hundred pounds of live weight, yet they did not make so good use of it, from the farmer's standpoint, as did the younger animals. The young animals, not only consumed a much larger proportion of food than did the older ones, but they seemed to be able to digest and assimilate it or to turn to good account a larger percentage of that which they consumed. But one says that young animals digest their food closer than do older ones. We do not know this to be true. While we recognize that very young animals are given food that is more easily digested, yet it is not known that they have greater powers of digestion than is possessed by older animals of the same breed.

I may say that the weights of the food during the earlier stages of the pig's existence are not given because they are not readily determined accurately, as the food normally consists largely of the mother's milk which, as to quantity, is difficult to estimate. As no method having as yet been discovered for drawing the milk from the dam equal to a litter of young pigs, experimenters have preferred to confine their work to later periods of life when the food could be accurately determined, both as to quantity and to quality.

While young animals produce a much greater gain in live weight for the food consumed than do older ones, and consequently produce a relatively cheaper market product, yet it is perhaps well for us to remember that as a food product the meat of the young animal and that of the older one should not be compared wholly by weight. While the deliciousness of the young meat may be the greater and, in many instances, this may be a most important factor, yet we

should not forget that it also has the greater water content. The food value and market price are not synonymous terms by any means. Without doubt the greater percentage gain in total live weight of the young animals is due, in part at least, to the fact that this gain is more largely of proteids, which necessarily means a great increase in the total amount of water.

If young meat or pig pork is produced by the consumption of less food, then the greatest profit lies in the production of such meat, provided the initial cost of the pigs at birth or at weaning time be left out of the question. The practical swine raiser, however, is forced to reckon the initial cost as well as the cost of food which the animals consume at later periods.

During the past two decades, or, perhaps, quarter of a century, we have heard much concerning early maturity, which is a most potent factor in the production of pig pork. Hastening the maturity of the animals which were reared for early slaughter has received much attention, and marked gains have been made, particularly with the small, compact, refined breeds. Formerly heavy pork was in greater demand than at the present time. With the increased demand for pig pork, breeders have successfully endeavored to hasten maturity and secure a greater and more mature growth at an early age.

In the past, comparatively little systematic attention has been bestowed upon the various breeds, with an idea of increasing the fecundity or prolificacy, that the initial cost of the animals which are fed for the production of pig pork may be lessened. It seems to me that here is an important field for improvement that has received comparatively little attention from those who are putting forth an honest effort to produce something better. It is generally conceded that the efforts to hasten maturity have had the effect of decreasing fecundity. While we do not know of any law that shows or tends to show that these two—early maturity and fecundity—are incompatible, yet one has been developed, undoubtedly, at the expense of the other. One has received marked attention; the other has not. The latter has undoubtedly been neglected and much to the detriment of the economical production of young animals for the market. When the swine breeders of the country devote their energies to the improvement of swine for the production of pig pork which shall include both early maturity and fecundity, without doubt a most marked change will be made. When we consider that the great effort made in this country was to produce a lard animal, and that these efforts were eminently successful, for in no other country has fat swine reached so high a degree of perfection, may we not confidently expect similar great changes when the breeders bend their united efforts in another direction? Taking into account the fact

that the great improvement of swine has been made in comparatively recent times, it not only seems reasonable that further improvement may be made, but that man may direct the improvement or changes along chosen lines if he only gives his best thought and efforts to that end.

The CHAIRMAN: We are now ready to hear the report of the Committee on Resolutions; Mr. Lighty, the Chairman of the Committee will present the report.

RESOLUTIONS.

MR. LIGHTY, Chairman of Committee on Resolutions: Mr. Chairman, your Committee on Resolutions submit the following:

Whereas, The citizens of West Chester and Chester county received and welcomed, with many generous acts of open-hearted kindness, this meeting of the State Board of Agriculture and Farmers' Normal Institute, and contributed very much to its success, therefore, be it

Resolved, That we consider ourselves under many obligations to them, and especially to their Chief Burgess, Charles H. Pennypacker, and to Dr. G. M. Phillips, of the West Chester State Normal School; and be it further resolved, that we tender our sincere thanks to the Brandywine and Foxcroft Granges for the excellent music, to Aaron J. Kift and son, Edward Harvey, Morris Palmer, and Isaac Passmore for the floral decorations; to the Traction Company for courtesies extended; to Messrs. Kates and Detrich, who made it possible by their generous liberality and thoughtful consideration for this body to examine the great work under way at the Harvest Home Farm; to the local Chairman, Mr. Norris G. Temple and Dr. M. E. Conard for the excellent arrangements for the comfort and entertainment of all those who attended, and for their untiring efforts which contributed much towards making this meeting a success, we extend our hearty thanks.

Your Committee note with pleasure that the ladies not only favored us with their presence at this Normal Institute, but earnestly and efficiently contributed to the real work of instruction for which they deserve the highest commendation. May this phase of the work be rapidly extended.

Among the prominent co-workers in the cause who favored us with their presence and gave instructive talks at our meeting, we desire to mention Hon. Franklin Dye, Secretary of Agriculture of New Jersey, and Hon. W. L. Amoss, Institute Director of Maryland, and Mr. Alva Agee, of Ohio. To the Hon. John Hamilton, Institute

Specialist for the United States, and other representatives of the National Department of Agriculture, and the representatives of our State College and Experiment Station, we desire to express our obligation.

To the press, local as well as general, we acknowledge our indebtedness.

Realizing the importance of centralized schools and township high schools to our rural population, we would earnestly urge more liberal appropriations of State funds to extend the same, and we would urge that the benefit of such appropriations be extended to such township high schools as are associated with boroughs of less than one thousand population, provided, a course of agricultural instruction is given in such schools.

And, whereas, all this educational effort was originated and made possible by the untiring zeal and energy of our Institute Director, A. L. Martin, be it

Resolved, That we acknowledge a debt of gratitude and extend a vote of thanks to him.

And further, we urge a more liberal financial support to the farmers' institute work of our State.

W. H. BROSIUS,
D. A. KNUPPENBURG,
L. W. LIGHTY,

Committee.

MR. DRAKE: I would like to add that this body instruct Director Martin to send our sympathy to the wife of Dr. I. A. Thayer who has been one of our most faithful workers in the past.

MR. CLARK: I move the adoption of the resolution.

The motion being seconded, it was agreed to, and the resolutions were declared adopted.

MR. MARTIN, Director of Institutes: Friends we shall carry away with us the remembrance of generous hospitality extended to us by the good people of West Chester and Chester county, and these scenes, we shall recall them in days and years to come. Our occupation differs from that of all others known to man, in that it started at the beginning of the human race and has been carried on through the ages down to the present day. It is the one occupation most essential, upon which all others are dependent. To bring to our minds the importance of the application of the highest order of development and intelligence to the operations upon the farm, the farmers' institutes have been inaugurated, the great schools upon wheels, which travel up and down the valleys and over the mountains of Pennsylvania to stimulate the farmer and equip him for this great occupation of agriculture.

Institute managers and lectures. I wish to thank you for the kind support you have given me and the expressions of confidence in the resolution just passed which is of more value to me than all the gold and silver in the mines of the world. The confidence of my fellow-men is of more value than all earthly treasures combined.

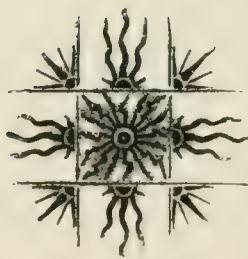
Thanking you for the generosity, kindness and forbearance that you have extended to me in the many years of the past, and speaking for you a safe journey home, I will say no more at this time.

The CHAIRMAN: I always look with pleasure to these State meetings and the pleasure has always been with me to have a warm shake of the hand of the chairmen and of the lecturers. It is always sad that in our meetings when it comes to the parting of the ways, and when the final hand-shake is taken that we must separate perhaps not all of us ever to meet again. I feel that I have learned, and I am satisfied that you have all learned something here, and I would say, let us carry that home with us and let us spread it out among our people. Sometimes you know people get a swelled head, and that is a disease that is incurable. There is no doctor who can give you medicine for a swelled head. I do not believe there are any swelled heads among the farmers' institute managers or among any of the lecturers, but I want to say, let us follow our leader; we have one here who I believe has his whole heart and soul with the agricultural people, and my hope is that he may be spared yet many years to carry on this work and to bring new ideas before our agricultural people, and I say, let us follow him.

On motion, the Institute adjourned.

A. L. MARTIN,

Deputy Secretary and Director of Institutes.



PROCEEDINGS

OF THE

TWENTY-NINTH ANNUAL MEETING

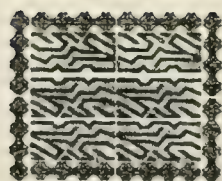
OF THE

Pennsylvania State Board of Agriculture,

HELD IN THE

HOUSE CAUCUS ROOM, AT THE CAPITOL, HARRISBURG, PA.,

JANUARY 24 AND 25, 1906.



MEMBERS
OF THE
PENNSYLVANIA STATE BOARD OF AGRICULTURE,
FOR THE YEAR 1906.

Members Ex-Officio.

HON. SAMUEL W. PENNYPACKER, Governor.
MAJ. I. B. BROWN, Secretary of Internal Affairs.
DR. N. C. SCHAEFFER, Superintendent of Public Instruction
DR. G. W. ATHERTON, President of The State College.
HON. WM. P. SNYDER, Auditor General.
HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

Gen. James A. Beaver, Centre County,Term expires 1907
R. I. Young, Middletown, Dauphin County,Term expires 1908
Col. R. H. Thomas, Mechanicsburg, Cumberland County, ...Term expires 1909

Appointed by the State Poultry Association.

Elected by County Agricultural Societies.

			Term expires.
Adams,	A. I. Weidner,	Arendtsville,	1909
Allegheny,	J. S. Burns,	Imperial, R. F. D. No. 1,	1909
Armstrong,	S. S. Blyholder,	Neale,	1908
Beaver,	A. L. McKibben,	New Sheffield,	1908
Bedford,	S. S. Diehl,	Bedford,	1906
Berks,	H. G. McGowan,	Geiger's Mills,	1907
Blair,	F. Jaekel,	Altoona,	1907
Bradford,	E. E. Chubbuck,	Rome, R. F. D. No. 16,	1907
Bucks,			
Butler,	W. H. H. Riddle,	Butler,	1906
Cambria,	H. J. Krumenacher,	Nicktown,	1906
Cameron,	W. H. Howard,	Emporium,	1906
Carbon,			
Centre,	John A. Woodward,	Howard,	1909
Chester,	M. E. Conard,	Westgrove,	1909
Clarion,	S. X. McClellan,	Knox,	1907
Clearfield,	J. W. Nelson,	Shawville,	1907
Clinton,	J. A. Herr,	Millhall, R. F. D.,	
Columbia,	A. P. Young,	Millville,	1909
Crawford,	J. F. Seavy,	Saegerstown,	1908
Cumberland,	Chas. H. Mullin,	Mt. Holly Springs,	1909
Dauphin,			

			Term expires.
Delaware,	R. M. Heyburn,	Ward,	1908
Elk,	John M. Witman,	St. Mary's,	1908
Erie,	S. D. West,	Wattsburg,	1907
Fayette,			
Forest,	C. A. Randall,	Tionesta,	1907
Franklin,	C. B. Hege,	Marion,	1908
Fulton,	R. M. Kendall,	McConnellsburg,	1907
Greene,	N. M. Biddle,	Carmichaels,	1907
Huntingdon,	Geo. G. Hutchison, ..	Warrior's Mark,	1909
Indiana,	S. M. McHenry,	Indiana,	1907
Jefferson,	W. L. McCracken,	Brookville,	1907
Juniata,	Matthew Rodgers,	Mexico,	1909
Lackawanna,	Horace Seamans,	Factoryville,	1907
Lancaster,	W. H. Brosius,	Drumore,	1907
Lawrence,	Sam'l McCreary,	Volant,	1909
Lebanon,	H. C. Snively,	Cleona,	1907
Lehigh,	P. S. Fenstermaker, ..	Allentown,	1909
Luzerne,	J. H. Snyder,	Trucksville,	1907
Lycoming,	A. J. Kahler,	Hughesville,	1909
McKean,	S. B. Colcord,	Port Allegany,	1906
Mercer,	W. C. Black,	Mercer,	1908
Mifflin,	M. M. Naginey,	Milroy,	1907
Monroe,	R. F. Schwarz,	Analomink,	1908
Montgomery,	J. Sexton,	North Wales,	1908
Montour,			
Northampton,	W. F. Beck,	Easton, R. F. D.,	1909
Northumberland,	I. A. Eschbach,	Milton, R. F. D.,	1908
Perry,	A. T. Holman,	Millerstown,	1907
Philadelphia,	E. Lonsdale,	Girard College, Phila.,	1907
Pike,			
Potter,	H. H. Hall,	Ellisburg,	1909
Schuylkill,	W. H. Stout,	Pinegrove,	1906
Snyder,	J. F. Boyer,	Freeburg,	1909
Somerset,	Jacob S. Miller,	Friedens,	1908
Sullivan,	E. R. Warburton,	Dushore, R. F. D. No. 3,	1909
Susquehanna,	E. E. Tower,	Hop Bottom,	1907
Tioga,	F. E. Field,	Wellsboro,	1908
Union,	J. Newton Glover,	Vicksburg,	1908
Venango,	August Morck,	Oil City,	1904
Warren,	R. J. Weld,	Sugargrove,	1908
Washington,	D. S. Taylor,	Raccoon,	1908
Wayne,	Warren E. Perham, ..	Niagara,	1907
Westmoreland,	M. N. Clark,	Claridge,	1907
Wyoming,	D. A. Knuppenburg, ..	Lake Carey,	1907
York,	G. F. Barnes,	Rossville,	1908

OFFICERS.

PRESIDENT.

Hon. Samuel W. Pennypacker, Governor, Harrisburg.

VICE PRESIDENTS.

P. S. Fenstermaker, Allentown.
A. J. Kahler, Hughesville.
S. M. McHenry, Indiana.

EXECUTIVE COMMITTEE.

Hon. Samuel W. Pennypacker, Harrisburg.
I. A. Eschbach, Milton.
H. G. McGowan, Geiger's Mills.
H. C. Snavely, Cleona.
Dr. E. E. Tower, Hop Bottom.
Sam'l McCreary, Volant.
J. Newton Glover, Vicksburg.
Dr. M. E. Conard, Westgrove.
N. B. Critchfield, *Secretary*, Harrisburg.

ADVISORY COMMITTEE.

N. B. Critchfield, *Secretary*, Harrisburg.
A. T. Holman, Millerstown.
H. C. Snavely, Cleona.
I. A. Eschbach, Milton.

CONSULTING SPECIALISTS.

Botanist, Prof. W. A. Buckhout, State College.
Pomologist, Dr. J. H. Funk, Boyertown.
Chemist, Dr. William Frear, State College.
Vet. Surgeon, Dr. Leonard Pearson, Philadelphia.
Sanitarian, Dr. Edward Patrick, West Chester.
Microscopists and Hygienists, Prof. C. B. Cochran, West Chester.
Dr. Geo. G. Groff, Lewisburg.
Entomologists, Prof. H. A. Surface, Harrisburg.
Prof. Franklin Menges, York.
Ornithologist, Prof. H. A. Surface, Harrisburg.
Meteorologists, E. R. Demain, Harrisburg.
J. L. Heacock, Quakertown.
Mineralogist, Col. Henry C. Demming, ... Harrisburg.
Aplarist, Prof. Geo. C. Butz, State College.
Geologists, Col. H. C. Demming, Harrisburg.
W. H. Stout, Pinegrove.

STANDING COMMITTEES.

LEGISLATION.

Hon. A. J. Kahler, Chairman, Hughesville.
Hon. Jason Sexton, North Wales.
Matthew Rodgers, Mexico.
J. Newton Glover, Vicksburg.
S. S. Blyholder, Neale.

CEREALS AND CEREAL CROPS.

S. X. McClellan, Chairman, Knox.

ROADS AND ROAD LAWS.

D. A. Knuppenburg, Chairman, Lake Carey.

FRUIT AND FRUIT CULTURE.

John F. Boyer, Chairman, Freeburg.

DAIRY AND DAIRY PRODUCTS.

R. J. Weld, Chairman, Sugargrove.

FERTILIZERS.

Howard G. McGowan, Chairman, Geiger's Mills.

WOOL AND TEXTILE FIBRES.

D. S. Taylor, Chairman, Raccoon.

LIVE STOCK.

Dr. E. E. Tower, Chairman, Hop Bottom.

POULTRY.

Dr. M. E. Conard, Chairman, Westgrove.

FORESTS AND FORESTRY.

James M. Platt, Chairman, Tunkhannock.

APIARY.

J W. Nelson, Chairman, Shawville.

FLORICULTURE.

Edwin Lonsdale, Chairman, Girard College, Phila.

FEEDING STUFFS.

Prof. F. D. Fuller, Chairman, Harrisburg.

PROGRAM.

ORDER OF BUSINESS.

Wednesday Morning, January 24, 1906.

Call to order at 9.00.

1. Roll-call.
2. Reading Minutes.
3. Appointment of Committee on Credentials.
4. Reception of Credentials of New Members and Delegates.
5. Reports of Specialists and Standing Committees:
 - a. Botanist, Prof. W. A. Buckhout, State College, Pa.
 - b. Pomologist, Dr. J. H. Funk, Boyertown, Pa.
 - c. Committee on Fruit and Fruit Culture, J. F. Boyer, Chairman, Freeburg, Pa.
6. Report of Committee on Credentials.
7. Election of Officers.
8. Unfinished Business.
9. New or Miscellaneous Business.

Wednesday Afternoon.

Call to order at 1.30.

1. REPORTS OF SPECIALISTS AND STANDING COMMITTEES—Continued:
 - a. Committee on Live Stock; D. A. Knuppenburg, Chairman, Lake Carey, Pa.
 - b. Veterinarian: Dr. Leonard Pearson, Philadelphia, Pa.
 - c. Committee on Apiary: J. W. Nelson, Chairman, Shawville, Pa.
 - d. Sanitarian: Dr. Edward Patrick, West Chester, Pa.
 - e. Committee on Roads and Road Laws; P. S. Fenstermaker, Chairman, Allentown, Pa.
 - f. Committee on Wool and Textile Fibres: D. S. Taylor, Chairman, Raccoon, Pa.
2. "WHEN SHALL WE LEAVE THE FARM?"
E. E. Chubbuck, Rome, Pa.

Wednesday Evening.

Call to order at 7.30.

1. REPORTS OF SPECIALISTS AND STANDING COMMITTEES—Continued:

- a. Microscopists and Hygienists: Prof. C. B. Cochran, West Chester, Pa.; Dr. Geo. G. Groff, Lewisburg, Pa.
- b. Entomologists: Prof. D. J. Waller, Indiana, Pa.; Prof. Franklin Menges, York, Pa.
- c. Ornithologist: Prof. H. A. Surface, Harrisburg, Pa.
- d. Committee on Poultry: Norris G. Temple, Chairman, Pocopson, Pa.
- e. Committee on Dairy and Dairy Products: R. J. Weld, Sugargrove, Pa.

2. "BREEDING LIVE STOCK ON THE FARM:"

Thomas Shaw, Professor of Animal Husbandry, University of Minnesota, St. Paul, Minn.

Thursday Morning, January 25, 1906.

Call to order at 9.00.

- 1. REPORT OF EXECUTIVE COMMITTEE.
- 2. REPORTS OF SPECIALISTS AND STANDING COMMITTEES—Continued:

- a. Chemist: Dr. William Frear, State College, Pa.
- b. Mineralogist: Col. H. C. Demming, Harrisburg, Pa.
- c. Geologists: Col. H. C. Demming, Harrisburg, Pa.; W. H. Stout, Pinegrove, Pa.
- d. Committee on Fertilizers: H. G. McGowan, Chairman, Geiger's Mills, Pa.
- e. Meteorologist: E. R. Demain, Harrisburg, Pa.

3. "BARN CONSTRUCTION AND SANITATION:"

H. E. Cook, Denmark, N. Y.

Thursday Afternoon.

Call to order at 1.30.

- 1. REPORTS OF SPECIALISTS AND STANDING COMMITTEES—Continued:

- a. Committee on Floriculture: Edwin Lonsdale, Chairman, Girard College, Philadelphia, Pa.
- b. Committee on Forestry: Irvin C. Williams, Chairman, Harrisburg, Pa.
- c. Committee on Cereals and Cereal Crops: I. A. Eschbach, Chairman, Milton, Pa.

2. "CARE AND HANDLING OF FARM ANIMALS:"

Dr. E. E. Tower, Hop Bottom, Pa.

3. "FEEDING FARM ANIMALS:"

Prof. Thomas Shaw.

Thursday Evening.

Call to order at 7.30.

- 1. REPORT OF COMMITTEE ON IDENTIFICATION OF FRUIT:

Dr. J. H. Funk, }
John F. Boyer, } Committee.
A. I. Weidner, }

- 2. REPORT OF COMMITTEE ON IDENTIFICATION OF VEGETABLES:

Joel A. Herr, }
Geo. G. Hutchison, } Committee.
Sam'l McCreary, }

- 3. REPORT OF COMMITTEE ON LEGISLATION:

Hon. A. J. Kahler, Chairman, Hughesville, Pa.

- 4. "BARN VENTILATION:"

H. E. Cook.

PROCEEDINGS OF THE ANNUAL MEETING OF THE STATE BOARD OF AGRICULTURE, HELD IN HARRISBURG, PA., JANUARY 24th AND 25th, 1906.

9 A. M., Wednesday Morning, January 24, 1906.

Vice President S. S. Blyholder in the Chair.

The CHAIRMAN: The hour has arrived for the opening of the Twenty-ninth Annual Session of the State Board of Agriculture. The Secretary will call the roll.

MR. HERR: Mr. Chairman, in noting the presence of members, those whose terms expire in 1906 should not be recorded.

The SECRETARY. That distinction will be made, Mr. Herr.

The roll of members was called by the Secretary, and at this first roll-call and a subsequent call, the following persons answered to their names, a quorum being present at the first roll-call; the names of those present whose terms expired in 1906, being recorded in italics:

R. I. Young, Gen. James A. Beaver, *A. I. Weidner*, S. S. Blyholder, S. S. Diehl, H. G. McGowan, E. E. Chubbuck, *W. T. Davis*, *J. A. Woodward*, *M. E. Conard*, S. X. McClellan, J. W. Nelson, J. A. Herr, J. M. Witman, C. B. Hege, R. M. Kendall, *G. G. Hutchison*, S. M. McHenry, W. L. McCracken, *Matthew Rodgers*, W. H. Brosius, *Samuel McCreary*, H. C. Snively, P. S. Fenstermaker, *A. J. Kahler*, W. C. Black, M. M. Naginey, R. F. Schwarz, Jason Sexton, *W. F. Beck*, I. A. Eschbach, A. T. Holman, *W. H. Stout*, *J. F. Boyer*, J. Newton Glover, R. J. Weld, D. S. Taylor, W. E. Perham, M. N. Clark, D. A. Knuppenburg, G. F. Barnes and N. B. Critchfield, Secretary.

Members ex-officio present were: Hon. S. W. Pennypacker, Governor; Maj. I. B. Brown, Secretary Internal Affairs; Dr. N. C. Schaeffer, Superintendent of Public Instruction.

The following consulting specialists were present: Dr. J. H. Funk, Pomologist; Dr. Wm. Frear, Chemist; Prof. Franklin Menges, Entomologist; E. R. Demain, Meteorologist; Col. H. C. Demming, Mineralogist and Geologist; W. H. Stout, Geologist.

The CHAIRMAN: A quorum being present, I will appoint as the Committee on Credentials, Messrs. Herr, of Clinton; Naginey, of Mifflin; Clark, of Westmoreland; McHenry, of Indiana, and Weld, of Warren.

The SECRETARY: Before that Committee goes out, it might be well to read the minutes of our last meeting.

The CHAIRMAN: Yes, pardon me, I forgot that; the minutes will be read by the Secretary.

The CHAIRMAN: You have heard the minutes of the last meeting, gentlemen, what is your pleasure?

MR. HUTCHISON: Mr. Chairman, I move the adoption of the minutes as read.

The motion being seconded, it was agreed to.

The CHAIRMAN: While the Committee is considering these credentials we will have the pleasure of hearing from visitors. We have the great pleasure of having ex-Secretary Edge with us, and we would be very glad to hear from him this morning.

MR. EDGE: Mr. Chairman, this is rather new to me; it is the first speech I have delivered in six years. My mind ran back to the first meeting of the Board, as I sat here and looked over the list, and I was impressed with the fact that of the members of the Board at that first meeting, there are now but two members living, Prof. Hamilton and myself. I do not know as I have anything further to say. I well remember that first meeting at which there were 21 members, 13 from the county societies, an unlucky number, usually, but it did prove to be lucky.

DEPUTY SECRETARY MARTIN: Mr. Chairman, when the Secretary called the roll of members it brought to my mind very vividly that I have been in receipt of a letter from an old and very worthy member, Mr. M. W. Oliver from Crawford county, stating that he is lying seriously ill which will account for his absence from this meeting. I think it will be well that the Secretary be instructed to address a letter of sympathy to him as coming from his fellow-members at this meeting.

The CHAIRMAN: Very well, we should be glad to have the Secretary do that.

The SECRETARY: Mr. Chairman, it would be better, in carrying out Mr. Martin's suggestion, that there should be a motion to that effect.

MR. SEXTON: Mr. Chairman, I move that the Secretary be instructed to carry out the suggestion of Mr. Martin and to direct a letter of that kind to the unfortunate brother.

The motion being seconded, it was agreed to.

The SECRETARY: Mr. Chairman, we may have as good an opportunity to get acquainted with Prof. Shaw now as at any time in the future. He is here to render us assistance, and I would suggest, that as a means of becoming acquainted with the audience and with the room in which he is to do his talking, that he come forward and tell us a few things now.

The CHAIRMAN: I am glad to present to you, Prof. Thomas Shaw, of Minnesota.

PROF. SHAW: Mr. Chairman and Gentlemen: I hardly know how it happens that I have not had the pleasure of seeing very much of your magnificent State until yesterday, and it was a little bit an-

noying, though complaints can be made against no individual, that the mist prevented seeing very much then, but I saw enough to create a longing to come back to see this country in its spring and summer glory, for judging by what was seen yesterday, it must be a magnificent country in the summer season. It seemed to me that it was a country covered with mines, that the hills were filled with wealth; and no doubt there is a great deal of truth in that thought. And probably that thought covers another thought, that might at first seem true, that the mineral wealth of the State of Pennsylvania is greater than the agricultural wealth. But I know that that is not true; the agricultural resources are greater. You honeycomb the mountains and take out the mineral wealth from those mountains and no power can ever put it back again, but the agricultural resources of this State go on and on, they flow on forever, so that I have no hesitation in saying that the first foot of soil is worth more than all the mines in all the mountains in this magnificent State. Now if that is true, sir, it is exceedingly important, how that first foot of soil shall be cultivated. I do not need to tell you intelligent gentlemen, in the face of the fact just stated, that the care of that first foot of soil is the most important concern that can engage the attention of the Legislature of this State, and it does give me a good deal of concern, a good deal of pain when I think of the way in which the first foot of soil is not taken care of in these United States of ours.

If the question were put to me: What is the agricultural crime of the American people, I would say it was the waste of the heritage which has been given us by our neglect in preserving the resources of the soil in this country.

I felt somewhat sad, sir, when I heard of the increase in the exports of agriculture from the United States. I would not feel thus if that increase in exports came in by way of animals and animal productions. I would not feel as bad; it would be a matter for congratulation, but when I heard that there is an increase of the exports of corn and other products that were taken out of the soil of this country and sent across the sea to be used by our competitors, I do feel sad when I think of it, and know that that is going on to the extent to which it is at the present time.

I frankly acknowledge that I do not know enough about the conditions of agriculture in the State of Pennsylvania to talk about it intelligently, but I do hope that the farmers of this State are studying that question of taking care of the soil. I hope that they are giving their attention to that question of keeping the soil from deteriorating. It is something that can be done, and if the person engaged in tilling the soil properly understands that it is his business interest to do this, no doubt it will be done.

I was told yesterday that this State pays out five million dollars annually for artificial fertilizers. I have no quarrel with that; it would be all the better if the State paid out ten million dollars if they were properly used, but I can't help but think that there is a way to get fertilizers, if wanted, without paying for them at all. Now, do not misunderstand me; I mean to say that in my judgment any one by giving more attention to good methods of agriculture can dispense with the purchase of artificial fertilizers, and can get what is needed without paying for it. If you ask me how, I would

say by buying the live stock from the western ranges and in the stockyards and bringing them to your farms and feeding that live-stock so that your fertilizer can be obtained practically without any other expense than putting it on the soil. If you ask me, Can this be done? I answer, I think it can. I know that food can be fed to these animals—I know that food can be fed either to cattle or sheep, and the man that feeds it will make some money, not perhaps a very great deal, in addition to the fertilizer which is thrown into the bargain. Now if that is true, it seems to me there is a wide open door for engaging in this work. It seems to me, sir, that there is no way of building up the soils of Pennsylvania than the one suggested, by grazing, by bringing sheep and putting them over these hills that we saw everywhere yesterday, by feeding rich food, food that is rich in fertilizing matter, and in this way make profits by growing sheep, and increasing the fertility of the pasture at the same time by doing so. But I fear I will trespass on your good nature by occupying your time further. You asked me to appear before you, and I have responded to the call. I thank you for the generous hearing which you have given me.

The CHAIRMAN: Now then, we are ready to proceed with the Reports of the Specialists and Standing Committees. We will first hear from the Botanist, Prof. Buckhout.

The SECRETARY: Mr. Chairman, Prof. Buckhout is not here, but his report is here, and can be read or can be printed without being read as may be desired.

It was moved and seconded that the report be printed without being read, which was agreed to. The report is as follows:

REPORT OF THE BOTANIST.

BY PROF. W. A. BUCKHOUT, *State College, Pa.*

My correspondence during the past year has not been materially different in character and amount from that of former years. The same questions periodically appear with slight differences in setting. Hence I select for particular mention only those which are typical and respecting which the farming community still needs to be specially informed.

Weeds of one kind or another are frequently sent me for determination, generally coupled with the inquiry, how to get rid of them. The golden-yellow or hop clover seemed unusually abundant and conspicuous last year, particularly in the northern tier of counties. This is a good type of a plant, technically, a weed, but really only a somewhat inferior species of its kind, and hence not to be encouraged. White clover or red should take its place, since they produce a larger quantity and more nutritious forage. This is sometimes accomplished naturally, the two latter species being the stronger growing and gradually displacing the former which is of a weaker constitution and less well adapted to most soils. Close cut-

ting of the yellow clover will often hasten the process of replacement, but should this not avail, resort must be had to plowing down and reseedling.

Special care should be taken that the seed used be clean and good, and that the ground be in condition to make a good seed-bed and thus favor quick germination. This is the whole secret, if such term may be used, for destroying undesirable plants, or weeds, and establishing strong, resistant growths of desirable and more useful grasses and clovers. It is true, this is not always an easy thing to do, but it is what should be aimed at, and the details of the process must be left for each one to supply, according to his conditions and surroundings.

With the Orange hawkweed, or "paint-brush," the case is much more difficult, since the weed is more aggressive and is very much at home in our lighter soils, where it crowds out the better pasture and meadow grasses, unless prompt measures are taken to dispossess it. It is idle to attempt to do anything in this instance except to plow the sod-lands and reseed them, preferably after a year or two of cultivation. The worst case of all is where small, close-growing creeping weeds, such as certain chickweeds and speedwells, permeate lawns, and gradually gain such complete possession that the beauty and serviceability of the lawn are ruined. Slight cases may yield to careful and persistent weeding, joined to watering and top-weeding with fertilizers, but, when the weed tenants have well entrenched themselves, nothing short of the plowing and reseedling process will avail, no matter how inconvenient or undesirable it may be on some accounts. There is nothing new in this. I repeat it, because I am convinced of its soundness, and have no faith in any of the special means of weed eradication. They are applicable and advisable only under particular circumstances, which do not inhere in the three instances named. The curious parasitic plant, dodder, was again reported several times from clover fields. Fortunately, it is not of very common occurrence in our State, and, when it is found, seldom covers any but small patches, here and there, of but a few square yards area. Within them it may grow profusely, and choke out everything which it touches. The whole tangled growth should be mowed and removed before its seeding can take place. It is not likely to appear a second year. It reproduces only from seed, and poor clover seed is probably always responsible for dodder in our climate.

Of plant diseases, I get various fragmentary examples, almost invariably too late to be of any service to the senders, and, sometimes, of such diseases as permit of no remedial measures at all. While my replies may thus be of no direct service at the time, they should lead to a more careful attention of farmers and fruit growers to the details of their business, so as to recognize the first appearance of a disorder, and thus apply in time such remedial or destructive measures as experience has determined best. The apathy and indifference in this regard are surprising, even in the simpler matter of insect attack. Many nurserymen and orchardists have never even seen the San José Scale, although it may be present on, and already injuring their trees. As well might a horesman expect to succeed in dealing in horses if he did not know the appearance of ringbone or spavin. It is "the stitch in time that saves nine" of plant dis-

eases that are purely seasonable, and for other reasons not controllable, an interesting one of this past season was the corn leaf-blight, which, I think, must have been quite prevalent over the whole State, although I know of it only in Centre and Chester counties. It caused the leaves to dry prematurely, giving the appearance of having been killed by frost. Slight rifts in the skin showed smut-like spores of a peculiar structure. A knowledge of the life history of fungi proves that this particular fungus caused the leaf drying. Presumably, such affected plants were less fruitful than otherwise, and, particularly, ripened their grain less fully. But, fortunately, a generally favorable season gave us, none the less, a corn crop remarkable for its abundance. Probably some good observers among our farmers could assign a particular figure, or percentage of loss, due to the unwonted appearance of this fungus visitant.

To my mind the most important matter of the season, was in the receipt of samples of rape plants and rape seed from several widely separated localities, with the inquiry whether they were of the true rape useful for feeding purposes. Few matters illustrate so well the value of a little, simple, technical knowledge. Rape is a general name for several varieties of mustard-like plants which are grown for two distinct purposes. First, for the seed, only, from which rape-seed oil is produced; second, for succulent forage, to be used particularly during late summer and fall. The first mentioned run rapidly to seed, and produce but little and poor leafage; the second are shorter stemmed with profuse growth of leaves, and usually do not produce seed the first year in this climate. The best known variety of this latter type is the Dwarf Essex rape, and this is what is desired for forage and soiling purposes. Unfortunately, the specimen plants and seeds which I received were all of the first or oil-producing type, and practically useless for forage. The growers were, therefore, greatly disappointed and inconvenienced. Indeed, it is probable that but few retail seed-dealers are acquainted with these facts regarding rape or are able to distinguish the two types of seed, since the differences are small and poorly defined. Reliance must be placed upon the seed-grower and faith in his integrity. From the carelessness of dealers, as shown in these cases referred to me, I incline to think that a suit for damages would be the best corrective. The purchaser has a right to expect not only clean seed, but seed true to the particular type named.

The CHAIRMAN: Dr. Funk is next on the program.

It appeared that Dr. Funk was not present.

The CHAIRMAN: The Doctor not being present, we will pass to the next topic, Report of the Committee on Fruit and Fruit Culture, Mr. J. F. Boyer, Chairman.

The SECRETARY: Mr. Chairman, I want to make a little explanation; I think I got a letter into the hands of everyone stating why it was that we met here. When the place for meeting came up I secured, what I thought was the very best place in the city, the United States Court room, and I thought there would be no trouble about it, but after that arrangement was made it developed that court would be held there on the date fixed for our meeting. The

gentlemen with whom I made the arrangement stated that such a thing as that had never occurred, and would not be likely to occur once in twenty years. That would have been a very convenient and pleasant room indeed, and perhaps the most so of any room in this city.

Just about ten days before the date set for our meeting, I learned that the United States Court was going to be in session on the twenty-fourth and twenty-fifth. Then I found that I was up against a proposition that was entirely unexpected, and I at once saw the Superintendent of Public Grounds and Buildings, and he said that he could give us this room and have it put in order so that everything would be as comfortable as would be required. I had no thought of any such noise going on here as we are now having, and I simply make these remarks so that you can understand the facts.

Mr. Boyer then read his report, which is as follows:

REPORT OF COMMITTEE ON FRUIT AND FRUIT CULTURE.

BY J. F. BOYER, *Chairman.*

Mr. Chairman and Members of the State Board of Agriculture:

The following is a brief report of the conditions of the fruit crop of the year 1905 in Pennsylvania.

First, as to the apple crop. Of all fruits the apple is the most important, as it can be held in its natural form the year round. This, however, does not apply to orchards planted by our forefathers. Those orchards are principally summer and fall varieties and certainly must take a back-seat, as new and improved varieties are taking the lead and common varieties will not, in ordinary crop season, bring enough money to pay cost of marketing.

Pennsylvania ranks fairly well with the apple-producing states of the Union, and by studying the improved varieties and selecting those best adapted for various soils found in Pennsylvania, the State will soon become one of the leading apple-producing states in the country. This fact is evidenced by the season just closed. The year 1905 goes on record as an off-year. Ohio, Michigan, Illinois and the New England states claim only a partial crop, even New York, which is known as a leading apple-producing state, reports a partial crop; while improved varieties brought forth a full crop in Pennsylvania. This of course applies only to sections where apple culture is made a business, as for instance Adams county, the home of the York Imperial, where this variety grows to perfection. Take the State as a whole, the apple crop was only a partial one; but it can be said that Pennsylvania ranks well with the leading apple-producing states of the Union. The quality also ranks well with those produced anywhere else.

Pears.—The pear generally is not grown, commercially, in Pennsylvania, excepting the Kieffer. A few orchards have been planted, commercially, and according to reports, do not produce as well as where fewer trees are planted with other varieties. By this we learn that cross-fertilization must be practiced. While blight seems to be

the destructive agent in all other varieties of pears, the Kieffer seems to be the most exempt, and if some variety can be found hearty enough to cross-fertilize the Kieffer, abundant crops can be grown. In its raw state it does not compare favorably well with such varieties as Bartlett, Seckel and a few others, but can easily be made into a Bartlett; just grow them on a suitable soil and pick before fully ripe and can, and you have a pear equal to the best Bartlett.

Peaches.—Of this fruit a full crop was secured in most parts of the State. The quality also was good; especially is this true where growers kept their trees in a high state of cultivation and did not allow their trees to overbear. In all such cases remunerative prices were obtained. The late fungi, however, could not be entirely controlled, as an excess of rain during the month of June and not enough sunshine caused some of this fruit to rot. This was more prevalent in some sections than in others.

Plums.—As usual, the Japan varieties brought forth a fair crop, while native varieties, as far as my knowledge goes, were almost an entire failure.

The Quince.—This fruit has almost been wiped out of existence by blight. The few scattered trees brought forth a fine crop.

Cherries.—It can be said that this fruit, especially the Morelloes (sour varieties), Early Richmond and Montmorency, produced fair crops and seem to hold the highest rank, being adapted to almost any and all soils and locations. Sweet varieties seem more choicy as to where they are planted. They are short-lived in valleys or low grounds, but seem to thrive fairly well on elevated light, warm soils.

Grapes.—This fruit is not grown, commercially, in Pennsylvania, excepting in the northern part of the State where the crop proves quite satisfactory to its owners. Spraying is of even more importance in growing this crop than in most other fruits.

Small Fruits.—Of this crop we can say it was a money-maker. The crop was an average one in most parts of the State and satisfactory prices were secured. Mention must also be made as to spraying. The small fruit growers must, in order to succeed, continually fight the various insect pests.

To sum up, I would say, the Pennsylvania fruit grower has no reason to feel discouraged, even though all he hears, or nearly so, at our horticultural meetings is about the various funguses, and more particularly about the San Jose Scale. This is all right; it sets us to thinking and those who have thus far tried to grow fruit in Nature's way ought to take the warning and put on their thinking caps and a business coat and realize that the man who grows fruit is selling his products at a profit, while the man who depends on nature to grow his fruit generally finds no profit in the business.

In conclusion, will say, since Nature does not grow profitable crops any longer and since spraying must be thoroughly done, cut down all trees that are of such varieties that their fruit crop does not bring enough money, when marketed, to pay the bill; for unless you destroy them they are a source of insect breeders, and while they served a good purpose and supplied father and mother with fruit, perhaps, all their lifetime and for that reason you leave them stand. By all means honor your father and mother and spray those trees thoroughly.

The CHAIRMAN: Gentlemen, you have heard this report; are there any remarks?

A Member: Mr. Chairman, I would like to ask whether the same treatment that will kill the San José Scale will also destroy the scurfy scale.

MR. BOYER: Yes, the lime, sulphur and salt will also destroy the scurfy scale.

MR. HUTCHISON: Mr. Chairman, we have with us Prof. Fuller. He is doing a line of work of interest to us all. He is a new man from New York State and I would like the members to meet him, and would call on him to come forward and say a word.

The CHAIRMAN: We shall certainly be very glad to have the pleasure of hearing from Prof. Fuller.

PROF. FULLER: Mr. Chairman and Members of the Board of Agriculture: Coming down from Clearfield county the other day on the train with Mr. Hutchison and the Secretary, Mr. Hutchison said, the State Board meets in Harrisburg next week and I would like to have you come and meet the members. I assured him of my pleasure in coming and meeting the members of the Board. I asked him on what subject I should speak. He said, well, tell them what you are doing for the farmers of Pennsylvania.

My work is under the direction of the Secretary of Agriculture, covering the inspection of stock feeding foods and ascertaining if they are pure and if they are up to the standard of excellence guaranteed by the manufacturers. Periodical visits are made by the agents of the Department in all the various sections of the State for the purpose of collecting samples that are found in the markets; these samples are forwarded to Harrisburg for examination, both chemical and microscopical. During the past year some three hundred samples have been secured in this way and sent to my laboratory. Only one serious adulteration has been found in the line of feeding stuffs. It was an adulteration discovered in the western part of the State where a sample of wheat bran was adulterated with rice hulls. This was a very serious adulteration, rice hulls being injurious to farm animals. Most of the violations of the law at the present time seem to be in regard to the improper branding of offals, especially of bran and middlings. The amendment to the present law, which was approved the 24th of April last, provides that the wheat offals and similar substances shall be tagged showing the percentages of protein.

During the past ten months between fifty and sixty prosecutions have been brought in ten different counties. Of these prosecutions we had fourteen cases against dealers handling a feed manufactured by a western firm, and the adulteration in these cases was a deficiency in the amount of protein and fat, the deficiency in protein varying from one to four per cent. and the deficiency in fat about one and a half per cent.; this of course caused a serious loss to the consumer. The manufacturer of this particular brand of feed has very wisely agreed to back up the dealers and pay the stipulated fines in each case, withdrawing the unfit goods from the market and either lowering the guaranties or improving the quality of this brand of

feed. This certainly is an important step in the right direction and is a material benefit to the dealers handling this feed manufactured in Western states.

Over two thousand dollars have been collected in fines. But the Department wishes it to be understood distinctly that this fact is of minor importance as compared to the fact of the benefit which the dairymen of this State will receive from this legislation.

I thank you very much for this opportunity for speaking a few words, and I hope I shall have the pleasure of meeting you individually.

THE DEPUTY SECRETARY: Mr. Chairman, I would like to make an inquiry. Prof. Fuller stated that there was a variation of the protein-contents in different brands. I would like to inquire if he found in his analysis of these brands that different grades of wheat would make a variation; if so, what causes that variation?

PROF. FULLER: I would state that I have found that the wheat offals of last year and this year also are of inferior quality. I believe that is due to climatic conditions; I believe that the millers are not able to get all the flour from the wheat, because I find that more or less flour is dragged down and goes into the bran and middlings.

MR. HUTCHISON. I would like to ask the Professor in reference to the samples of Western goods analyzed, in dollars and cents; what variation was there between their guaranty and what you found?

PROF. FULLER. I would state that it is almost impossible to set any definite common price for protein and fat, although I made a calculation approximately and found there was a difference of between five and seven dollars between the price set by dealers and the actual value. Feeding stuffs are entirely different from fertilizers; in feeding stuffs we not only have protein to create fat but we have the ash and the carbohydrates; we find all these materials in feeding stuffs and they all serve their purpose. It is almost impossible to state any common value for the protein and fat.

A Member: Mr. Chairman, I would like to ask the Professor if he has ever made any analyses of buckwheat flour sold on the market.

PROF. FULLER: I would state that I have not.

A Member: Mr. Chairman, I would like to ask the speaker whether he found any particular adulterants that came from the West?

PROF. FULLER: I would state the only adulteration I have found during the past few months was the substitution of oat hulls for the whole oats. The manufacturers in the West use only the best grains for their breakfast foods, take the breakfast foods where oats are used, and they use only the best oats. As I have already stated, rice hulls have sometimes been used as an adulteration, and coffee hulls are sometimes found.

A Member: I would ask if we are to understand that some of these samples were under the value to the extent of six or seven dollars a ton?

PROF. FULLER: I would state the analysis showed a value of five or seven dollars a ton below the selling price, due to the deficiency in the most important ingredients in the feeding stuff, protein and fat.

The SECRETARY: That was below the selling price and not below what the price should have been according to the guaranty?

PROF. FULLER: Yes.

MR. HUTCHISON: Mr. Chairman, I might state that the results of his work will be published in a bulletin and can be had by any one interested. The chemical work is now going on, and in a month or six weeks the bulletin will be ready for distribution, giving all the results of the analyses, together with other information. The Department will be glad to supply copies to anyone making application.

MR. CHUBBUCK: Mr. Chairman, this discussion brings to my mind a little thing that happened to me last fall. I raised and wished to grind about five tons of buckwheat flour. I found what the price was in my own town, where there is a large mill that grinds and ships flour, wherever it is wanted, by the car or by the ton. In the city of Philadelphia is a firm guaranteed by *The American Agriculturist* as being all right, and I wrote to that firm and asked them what they could handle three to five tons of buckwheat flour for, and they wrote back to me a price that was 25 cents less than I could get from the wholesaler in my own town. Now, why was that so? All I had to do was to take my buckwheat to this mill and he took the flour at \$2.50 per hundred, while I would have had to take the flour and ship it to Philadelphia and there realize only \$2.25 a hundred.

MR. HUTCHISON: Mr. Chairman, it might be that Philadelphia has an over-production or that they have a market they can draw upon which furnishes them all they need. It might be that they were getting buckwheat adulterated with some cheap product. In the work I was doing this year, I ran across a gentleman who was selling corn flour, large quantities of it. I overheard a conversation between two or three millers, men whom I knew very well, and they stated that you could use with profit, corn flour as a mixture with buckwheat flour, and reduce the price, but whether they did this or not, that I cannot say, but that might be another reason, or they might be using some wheat flour, perhaps.

MR. CHUBBUCK: In my question I did not think that they could draw from any other section where they could get it any cheaper than that.

MR. SEXTON.: Mr. Chairman, it has been our annual custom to appoint a committee to wait upon the Governor to let him know that the State Board of Agriculture is in session.

I therefore move that a committee be appointed to wait upon the Governor and inform him that the State Board of Agriculture is now in session.

MR. HUTCHISON: I second the motion.

The question being put, it was agreed to.

The SECRETARY: I may say to that committee that the Governor is not in the city to-day. He is aware of the meeting but has duties calling him away from the city.

MR. HUTCHISON: Mr. Chairman, we have with us a State official whom I know you would all be glad to have a word from, Major I. B. Brown, Secretary of Internal Affairs, a member of our Board. This is a little experience meeting and I know you will be glad to hear from him.

The CHAIRMAN: We certainly would be pleased to hear from Major Brown.

MAJOR BROWN: Mr. Chairman: The gentleman has said that this is an experience meeting; I have just dropped in here simply to get my name on the record as being present. It is the first time I have been out of my house for the last ten days. I have been laid up with rheumatism, but I am glad to know that my friend from Huntingdon and others are giving their experiences. All of us have had our experiences in all those things which make up human life, and those who have had experience on the farm, have had experience in the avocation which has made this world, its industries and development very largely what they are. We may talk about our railroads and the great service they have done in developing natural and material interests, yet behind all this is the man on the farm with the hoe and the shovel, with the plow and the reaper and the mower, doing that work on which all others so very largely depend.

In my political life I have never had an opportunity of mingling very much with the agriculturists of the Commonwealth, my line of public service being more with corporations, more with the varied industries of the Commonwealth, the manufacturers and all the lines of enterprises connected with corporate service, so that I have never been able to touch elbows in the work and in the developments in which you are so earnestly engaged; but when I think of my own native State of Pennsylvania, and ride through it, as I have so frequently in years past, and see the farmers working upon the highlands and in the valleys, certainly there is everything that meets our eyes to convince us that the State of Pennsylvania cannot in any way afford to be unmindful of the loyal services of our citizens who are engaged in agricultural pursuits.

Now I do not know—I hadn't the remotest idea of being called upon to say anything here—I do not know what your program is, and my remarks, of necessity, must have been rambling, but I do take it as a great honor that you have conferred by permitting me to say this much on this occasion.

The CHAIRMAN: The committee to wait upon the Governor are Messrs. Sexton, Chubbuck and Knuppenburg.

COL. WOODWARD: Mr. Chairman, with your permission, I am not going to relate my experience, but I would like to contribute a little information to the members of the Board.

I presume that every one of us realizes the importance of Pennsylvania as a dairy state. We stand second or third in the importance and value of that industry.

You know that our State College has for sometime been in the throes of reorganization of its agricultural faculty, and you know,

too, that we have been deprived for some time of the services of Professor Hewitt, who usually attended our meetings and was an active and efficient professor of dairying. I do not know that you are all aware, though I presume most of you are, that we have lately succeeded in obtaining the services of a professor of dairy husbandry, having enlarged that department, and that we have lately succeeded the liberality of the State—have succeeded in manning it to the extent of putting in charge a professor of dairy husbandry. I do not want you to think that that is the whole force that is intended to be utilized in that building, that new building which some of you have seen and enjoyed and appreciated, but I want you to know that we have secured a man whose reputation is second to none of his age in the country, who is entirely competent to take charge of the dairy interests in Pennsylvania and to look after them as they have never been looked after before.

One of our allied organizations, the Dairy Union, has recognized the ability of our young friend, and recognized his importance to the dairy interests of the State by making him the President of the Dairy Union, and I want to ask permission of the Board to present to them, for just a moment, this gentleman in order that you may look in his face and become acquainted with him. I refer to Professor H. E. Van Norman, from Purdue University of Indiana, now Professor of Dairying in the State College of Pennsylvania, and I have great pleasure, with the permission of the Chair, in now presenting to the Board, Professor Van Norman.

The CHAIRMAN: Will the Professor please come forward?

PROF. VAN NORMAN: Mr. Chairman and Gentlemen of the State Board: That is about as embarrassing an introduction as I ever had.

MR. HUTCHISON: That don't hurt you; we know you.

PROF. VAN NORMAN: I may say that in accepting the position which the trustees of your State College offered me, I did it with a full appreciation and knowledge of the fact that Pennsylvania ranks second in the volume of her dairy products, and that dairying is a very important factor in the agriculture of a State which, sometimes in the minds of some people, is overlooked. Agriculture is a very large factor in the welfare of the Commonwealth of Pennsylvania, and at this time I can only say that it will be my purpose to make the Department, over which I have charge and responsibility, serve the dairy and agricultural, and directly or indirectly, all the interests of the State to the full extent of its possibilities. My work is educational and in as far as the educational work of the dairy department of the State College can serve you, I am at your service and I shall appreciate your interest in the work. I am ready to help the cause of better dairying to the best of my ability. Large numbers of cows are kept at a loss, as investigation in this and other states shows. It shall be my purpose to lessen the number of cows kept at a loss, and the number of horses kept at a loss, primarily, by teaching these young people whom you see fit to send there, what they need to know. We have at the present time in progress a creamery course, and I hope to be able to increase it and to add other courses

such as care, handling, feeding and production. This State produces an immense quantity of milk, some of it used right near where it is produced, and some that is shipped. At the present time we offer no course in that work, but there is much that can be taught that will be beneficial even from the point of view of dollars and cents.

As I conceive, our education should do two things, broaden the young man's grasp and increase his earning power in taking advantage of these opportunities, and it will be my purpose to work to this end.

It is said that we cannot get people to the State College because of its location. I hope that will not deter you gentlemen from coming there; some of you already know that the State has been liberal in its appropriations for equipments and in the way of a building for dairy husbandry work. I hope to make the work merit its continued support, and I hope I may have the privilege of meeting you there personally, and of welcoming you to an investigation of our work there now and in the future.

COL. WOODWARD: Mr. Chairman, with your permission, I would like to contribute another experience, or make another statement.

The CHAIRMAN: We shall be glad to hear from you further.

COL. WOODWARD: I know that you have enjoyed this because I know the feeling that exists throughout the State; I know that you have enjoyed the experience of learning that you have a man at the head of that work who is amply qualified to promote its interests throughout the Commonwealth. Now, what I am going to speak of, it has not been permitted to speak of earlier than this because the situation has been such that it could not before be made public, but at the meeting of the Board of Trustees last night certain action was taken which permits me to bring this to your attention now. If the question of dairying is important, and it is, the question of animal nutrition in all its breadths and depths and lengths is more important, because the greater includes the less.

Your servants and the servants of the whole people of the State, the Board of Trustees of State College, have felt this and appreciated this for a long time, and those of you who follow these questions closely, know that we have in the service of the State a man who is recognized throughout the United States, as the authority upon animal nutrition. He is recognized by the Department of Agriculture as an authority upon that subject, and because of that recognition by the Department of Agriculture, some years ago the Department undertook to buy and to co-operate with the Board of Trustees of the College in the establishment of a new, scientific instrument, specifically known as a respiration calorimeter. Most of you have seen it there and investigated it, but I do not believe that very many of you know very much about it. I could not explain it to save my life, and I do not believe that my friend, Dr. Tower, could tell very much more about it than I can. It was placed there by the National Department of Agriculture, the first and only one in the work, because they recognized the ability of the gentleman whom I have mentioned, because of his deep research into the question of animal nutrition, a research not approached by any other man in the United States.

In considering the reorganization of our agricultural department at the College, and in accepting in good faith the appropriations that have been made for the new agricultural buildings, including the dairy buildings, which are recognized now among the finest in the United States, and in accepting the responsibility thus placed upon us by the State, it was deemed wise that the Department of Agriculture should have enlarged facilities, and it occurred to some of us that to separate from the technical work of the Experiment Station, which is a part of our work at the College, the distinguished gentleman to whom I refer in the line of animal nutrition, would be a desirable change. To relieve him from the direction and detail of the executive work and to set him aside in order that he may use his recognized skill and qualifications for better and deeper research along the special line in which he has so much distinguished himself, of animal nutrition, therefore, the trustees of the College have set aside Dr. Armsby to this work, and in a sense have consecrated and dedicated him to it. He has arrived at the maturity of life; he is developed and equipped for this work as no other man in the State or the United States is. Those who know him and his great work fully realize this. We have, therefore, made a separate department of this branch apart from the work of the Experiment Station, naming it "The Institute of Animal Nutrition," and have called Dr. Armsby "The Director of Nutrition," and set him aside for that work, relieving him of this drudgery of the Experiment Station and propose to put that upon the shoulders of a younger and newer man who will have the opportunity to grow into the just reputation that Dr. Armsby now enjoys.

Now, then, I have the pleasure of presenting to you our old and distinguished friend, Dr. H. P. Armsby, as the Director of the Institute of Animal Nutrition, and the greatest authority in the United States to-day in that field.

DR. ARMSBY: Mr. Chairman and Friends: If Colonel Woodward's introduction of Prof. Van Norman was embarrassing, I am very sure that he has very much improved upon it in that respect in his introduction of me, yet I confess that I rather welcome this opportunity, this public announcement of the change for several reasons, and among others, because it relieves me, in a degree, from some embarrassment arising from my knowledge of this proposed change. I necessarily stood for the past few months in what was, in a way, a false position, as officially and ostensibly representing the administration of the Experiment Station, and, by implication at least, the general agricultural work of the College, while at the same time I knew myself that that work was to be taken up very shortly by some one else, and for that reason I am very glad that the time has come when the situation could be cleared up, and the exact relation of things made public.

Now let me say most emphatically that this change does not in the slightest degree lessen my interest in the general agricultural progress of Pennsylvania, and I hope that whenever there is a possibility of my serving the interest of this Board of Agriculture, or the interest of agriculture in this State, that I may be called upon, and I assure you that you shall have the best effort of which I am capable. I should be exceedingly sorry if this change should lessen

in any degree the very pleasant relations which have existed for so many years with the members of the Board of Agriculture and with other agricultural organizations in this State; and while we are looking toward, and confidently anticipating a very much larger development in the Department of Agriculture at the State College, I hope to keep somewhat in touch with them in the future as I have in the past.

Let me say one thing more: It seems to me that this change is a significant one, because it is a more marked, and to me of course very flattering recognition of the importance of abstract research into the fundamental principles underlying the art of agriculture. Those of us who can look back fifteen or twenty years, can readily see what this means. Those who can remember the general estimation in which such investigations were held twenty years ago, the attitude of the agricultural press and of agricultural meetings, farmers' institutes and boards of agriculture toward them, will see that a very marked progress has been made within a decade; that the fundamental importance of scientific research—research into principles as distinguished from the investigations into the applications of principles and practice has made tremendous strides, and I believe nowhere is it more marked than in Pennsylvania, and I trust that the work of this new department of the College, while it will necessarily be abstract, which will sometimes seem to have very little relation to important practical problems, yet I venture to hope that in the long run, it may be as practically serviceable to the agricultural interests of Pennsylvania as any other line of work which the institution may undertake.

COL. WOODWARD: Mr. Chairman, I simply want to make a statement in regard to the future of the Department of Agriculture at the State College. We have undertaken a new organization; we believe that Pennsylvania is now ripe for wonderful and new developments in agriculture, and we realize that under the organization of agriculture in this State, the State College must be kept abreast of the needs of the people engaged in the various lines of agricultural industry.

We have undertaken to secure leaders in the work. What we have done in some directions you have seen this morning, and I want to say to you that we are looking earnestly and seriously and constantly for men to take the lead in agricultural education in the various branches of the work. We are looking for large men, we are looking for capable men, for men old enough to be thoroughly equipped for the work, and yet young enough to have an opportunity to make a record for themselves in life, and anxious and energetic enough to make that record. The gentleman whom we have in view at present, I shall not be able to name in connection with the direction of the State Experiment Station, but I want to say to you that we have in view and have strong hopes of securing the services of a man who is conceded by some of the best agricultural authorities in the State to stand not lower than third in the list of men available for the position, a man of large experience, of largely developed equipment, great ability and nationally of recognized worth in the agricultural line. We hope to secure the services of that man. I simply wanted to make this statement for the encouragement of my friends upon the Board so that they may realize

that we are trying earnestly and seriously and with all our might to improve and develop the agricultural interests of the State, and to promote the efficiency of the work done in the agricultural department of the State College, so that it will be a credit to the State and of advantage to every working farmer at home as well as to every scientific farmer in the Commonwealth.

DEPUTY SECRETARY MARTIN: Mr. Chairman, I am gratified that you have had the pleasure of looking into the face of Prof. H. E. Van Norman. It was my especial pleasure to introduce Prof. Van Norman at Troy, Bradford county, last November, where was carried on a three-days' demonstration work in the handling of milk and testing it by the Babcock test, as well as the actual process of butter-making. The thought that we want to impress upon your minds as members of the Board and as Chairmen of County Farmers' Institutes is, that we have in mind the fact that Prof. Van Norman has kindly consented, so far as his work at the State College will permit him, to join with us and to help us in this dairy demonstration work in the dairy regions and portions of Pennsylvania, and those of you who have charge of institutes in the various counties should bear this in mind and at certain times, when we find it convenient to hold a demonstration school in your county, confer with us, and arrangements can be made in the future.

The Secretary read a letter from Dr. D. J. Waller, of Indiana, Pennsylvania, which was referred to the Executive Committee.

MR. HUTCHISON: Mr. Chairman, I would like to ask for information? What committee makes up the list of these Consulting Specialists.

The SECRETARY: The Executive Committee.

MR. HUTCHISON: I think there should be added to that, the subject of Concentrated Feed Control. Should that be taken before the Committee or before this body?

The SECRETARY: That would be for the Board to decide.

MR. HUTCHISON: Mr. Chairman, Prof. Fuller is here with a well equipped laboratory, and I think such a committee should be created and have a report from him each year to this Board. The Credential Committee has not reported yet, therefore, I do not want to make a motion, because it might be presuming to do so; I think that some good member who holds over might make that motion.

The SECRETARY: It might be well to suggest that to the new Executive Committee that will be elected in a little while, and perhaps they may have some report to make on that subject.

MR. EDGE: Mr. Chairman, originally those Specialists were all nominated by the Secretary; that was the original plan. The Secretary nominated the Specialists to the Executive Committee and they either confirmed or rejected, as they saw fit.

The SECRETARY: I can only answer what the course has been since I have been Secretary of the Board. At the first meeting after I came into my place, the Executive Committee made the ap-

pointments and so it has been done ever since. I do not know whether that rule obtained before that time or not. Perhaps some of the older members of the Board can tell us how that matter was. It seems to me that the Executive Committee is entirely competent to do this work, and perhaps they can do it as well, if not better, than the Secretary.

MR. EDGE: I can readily see that you want to get out of the responsibility. I think it is a good thing to do if you can

MR. FENSTERMAKER: Mr. Chairman, this is a very important question; one of the most important, and I move to refer it to the Executive Committee.

The motion being seconded, it was agreed to.

The CHAIRMAN: I see before me Dr. Conard; we should be pleased to hear from him.

DR. CONARD: Mr. Chairman and Members of the Board: I did not expect to be called upon, but I do feel like saying that we may congratulate ourselves in having with us a Professor of Dairying who is at our service and capable of giving us instructions that we so very much need. Probably that strikes me a little closer than it does some others. I live in a dairy district myself, and for the last few years, particularly, it has been my duty to educate, in a measure, a great many people in the handling of milk, particularly for city trade, people who have been educated principally in an opposite direction, so as to be in need of instruction. Their market has been of such a character as to favor the production of milk at a time it was not wanted in the city. The requirements of the market have been such, too, that it did not favor careful handling and did favor rather the improper handling, I think I might say, and to change the character of their market and the character of its requirements has been necessary, and the results I must say have been somewhat satisfactory, but I do feel the need of just what we are told we have and what I know we have in Prof. Van Norman, and as Secretary Martin has kindly offered to the State his services at dairy demonstrations, I think that Secretary Martin will hear from me very soon on that topic. I do not know of anything that can be of more service to us than just such demonstrations as have been alluded to. If we are only second now in the United States, as a dairy state, a little bit more effort, I think, will make us stand a little higher than that. It is true that the Philadelphia market is being supplied more from Pennsylvania than it ever was. The State of New Jersey has contributed very liberally to the Philadelphia market until very recent years, but the tendency now is for New Jersey to consume her own products. She is a truck-garden state, a large proportion of it at least, and she has consumed her own products largely of late. Little boroughs and towns all over the State of New Jersey are growing to such an extent that they can consume the most that is produced in their own neighborhood, so that Philadelphia has to look elsewhere for her supply. New York milk has been shipped to Philadelphia to a great extent, but for obvious reasons; that is not as it should be, and the trend now is to look to Pennsylvania for supplies. It has had a tendency to develop dairy industries in that par-

ticular section of the State. It is being developed and is going to be developed more and more. It is very gratifying to know that the State College is in a position to help us out.

MR. HUTCHISON: What would be your idea of establishing a condensed milk factory in a good farming district, but not convenient to a milk market?

DR. CONARD: I think the time is near when condensed milk is going to be used more and more. It is unquestionably true that the condensed milk market is going to grow, is growing and has grown. As a matter of profit to the purchaser of condensed milk, it would seem to me that they should be located in remote districts where it is inconvenient to ship milk or even butter to the markets. Condensed milk can be shipped anywhere wherever it is wanted, just about as well as any other product. There are two condensed milk factories near Philadelphia, one near Malvern and another one at Kennett Square. The first two are doing well; the latter, I believe, is not enjoying quite so much prosperity.

MR. HUTCHISON: What do they pay a quart or a gallon for the milk?

DR. CONARD: I do not know; their price fluctuates very much. I think Prof. Van Norman can tell you the price, perhaps.

PROF. VAN NORMAN: I am not able to give the information.

DR. CONARD: I think in the neighborhood of \$1.50 at the present time, but very much lower in the summer time; the price varies considerably.

PROF. SHAW: Mr. Chairman, I would like to ask the gentleman if he can give approximately the cost of transportation of condensed milk and butter.

DR. CONARD: No; I have not been in that line of work at all, but there would not be so very much difference in cost. Of course, condensed milk could be transported to greater distances. I think probably the cost of freight alone would not figure so largely as the inconvenience of refrigeration.

MAJOR BROWN: Mr. Chairman, I would like to say that in the town where I live, at Cory, they have a very successful condensed milk establishment. It is a financial success as an institution, and is also, I believe, a great benefit to the farmers.

Possibly the town in which I live may be so remote from the centers of the commercial world as to have that institution fit nicely in that locality, but I know something about the scheme which originated it.

The parties who broached the proposition went to the farmers around there and offered them an advance over what they were getting for milk or butter at the creamery. I forget now what that advance was, but it was a considerable advance, and the result was, that nearly all the farmers around there are bringing their milk to that condensory, and as I said before, it has been a successful enterprise. The products of the factory are largely sent to New York

and Pittsburg, and some considerable amount of it goes to the markets of other great business centers of the country, but as to that institution I know it is a success.

The CHAIRMAN: Now, gentlemen, we are ready to hear the report of the Committee on Credentials. Mr. Herr, the Chairman of the Committee, will present the report.

MR. HERR: I first wish to make a statement to the Board, that the terms of certain of the members we have made to expire in 1908 agreeably to the resolution that was passed at the meeting at West Chester, so as to even up the terms of the members of the Board, and have about one-third expire each year.

REPORT OF THE COMMITTEE ON CREDENTIALS.

The Committee on Credentials Respectfully Report That They Have Examined the Credentials of the Following Persons for Membership in the State Board:

Name.	Address.	Term Expires.
1. A. I. Weidner,	Arendtsville, Adams Co.,	1909.
2. R. M. Heyburn,	Ward, Delaware Co.,	1908.
3. A. J. Kahler,	Hughesville, Lycoming Co.,	1909.
3. Samuel McCreary,	Volant, Lawrence Co.,	1909.
5. I. A. Eschbach,	Milton, Northumberland Co.,	1908.
6. J. F. Seavy,	Seagerstown, Crawford Co.,	1908.
7. Matthew Rodgers,	Mexico, Juniata Co.,	1909.
8. A. P. Young,	Millville, Columbia Co.,	1909.
9. Geo. G. Hutchison,	Warriors Mark, Huntingdon Co.,	1909.
10. Chas. H. Mullin,	Mt. Holly Springs, Cumberland Co.,	1909.
11. Jacob S. Miller,	Friedens, Somerset Co.,	1908.
12. Dr. M. E. Conard,	Westgrove, Chester Co.,	1909.
13. E. R. Warburton,	Forksville, Sullivan Co.,	1909.
14. W. F. Beck,	Easton, Northampton Co.,	1909.
15. J. F. Boyer,	Freeburg, Snyder Co.,	1909.
16. J. S. Burns,	Imperial, Allegheny Co.,	1909.
17. Horace H. Hall,	Ellisburg, Potter Co.,	1909.

The Committee further report that the credentials of Mr. Horace Seamans, of Lackawanna county, not being in due form, we recommend that he be received as a member at this meeting with the privilege of presenting credentials in proper form to the Secretary.

In the case of the credentials of Watson T. Davis, of Bucks county, your Committee report that the credentials are not correct from the fact that they are not signed by the officers of any agricultural organization. Your Committee recommend that he be seated as a member at this meeting.

The credentials of Norris G. Temple, from the State Poultry Association, were received and your Committee refuse to accept the credentials of Norris G. Temple and decline to recommend that he be seated as a member.

The Committee still further report that we have examined the credentials of the following persons, representing agricultural organizations, and recommend that they be admitted to sit as advisory members:

Name.	Address.	Representing.
S. P. Hellman, M. D.,...	Heilmandale,	Lebanon Co. Ag'l and Hort, Ass'n.
Ira J. Light,	Lebanon, Pa.,	Lebanon Co. Ag'l and Hort, Ass'n.
John H. Bennetch,	Newmanstown, R. F. D. No. 1,	Lebanon Co. Ag'l and Hort, Ass'n.
E. S. Risser,	Lawn,	Lebanon Co. Ag'l and Hort, Ass'n.
Edward Shuey,	Lickdale, R. F. D. No. 1,	Lebanon Co. Ag'l and Hort, Ass'n.
John F. Boyer,	Freeburg,	State Horticulture Association.
H. A. Surface,	Harrisburg,	State Horticulture Association.
Enos B. Engle,	Waynesboro,	State Horticulture Association.
R. M. Elder,	Aspers,	State Horticulture Association.
Chester J. Tyson,	Floradale,	State Horticulture Association.
A. Roberts, .....	.....	Adams Co. Agricultural Ass'n.

J. A. HERR,
R. J. WELD,
S. M. McHENRY,
M. M. NAGINEY,
M. N. CLARK,
Committee.

It was moved and seconded that the report be received and adopted as read, and that the members named in the report be seated as recommended. Agreed to.

MR. RODGERS: Mr. Chairman, I would like to add the name of Hon. W. C. Pomeroy, of Port Royal, who was elected to represent the Juniata County Agricultural Society.

MR. HUTCHISON: I would like to add the name of John T. Patton, as a representative of Grange No. 974, of Warrior's Mark, as an advisory member.

The CHAIRMAN: Shall these two gentlemen be received and accorded the floor as advisory members?

It was moved and seconded that the two gentlemen named be received, as requested, as advisory members and accorded the privileges of the floor; which was agreed to.

The CHAIRMAN: Now, then, gentlemen, we are ready to proceed to the election. I will appoint Messrs. Hutchison and Barnes as tellers. The first will be the election of Vice Presidents.

The nominations for Vice Presidents were as follows:

P. S. Fenstermaker, A. J. Kahler and S. M. McHenry.

It was moved and seconded that the nominations close; which was agreed to.

MR. HUTCHISON: I move that the Secretary be authorized to cast the ballot for the three gentlemen named.

The motion being seconded, it was agreed to.

The SECRETARY: I have the pleasure of casting the ballot as follows: For Vice Presidents, P. S. Fenstermaker, A. J. Kahler and S. M. McHenry.

The CHAIRMAN: I therefore declare the three gentlemen named duly elected as Vice-Presidents.

Mr. Fenstermaker will please come forward and assume his duties.

MR. FENSTERMAKER (in the Chair). Gentlemen of the Board this is entirely unexpected, but my friend Hutchison there is something of a politician, and somehow or other politicians always get on top.

We hope, with your assistance, to get through with the business in a satisfactory manner, and we will at once take up the next regular order.

The SECRETARY: The election of an Executive Committee, I think, is the next in order.

The CHAIRMAN: The Executive Committee then will be the next in order; the Governor, I believe, is ex-officio the President of that committee. There are nine names for members of the Executive Committee.

MR. HERR: Are nominations in order?

The CHAIRMAN: They are.

MR. HERR: I nominate Mr. I. A. Eschbach.

The following gentlemen were also nominated: J. Newton Glover, of Union; H. G. McGowan, of Berks; George G. Hutchison, of Huntingdon; M. N. Clark, of Westmoreland; Dr. E. E. Tower, of Susquehanna; H. C. Snively, of Lebanon; Samuel McCreary, of Lawrence, and Dr. M. E. Conard, of Chester.

MR. HERR: I move that the nominations now close.

MR. EDGE: Mr. Chairman, you have only seven to elect.

MR. HUTCHISON. Now my friends, you have always been very kind to me and I will withdraw.

Mr. M. N. Clark also withdrew.

MR. HERR: I move that the Secretary be authorized to cast the ballot for the seven gentlemen who have been nominated.

The motion being seconded, it was agreed to.

The SECRETARY: In compliance with the motion just adopted, I cast the ballot for the Executive Committee as follows: Messrs. I. A. Eschbach, of Northumberland; J. Newton Glover, of Union; H. G. McGowan, of Berks; Dr. E. E. Tower, of Susquehanna; H. C. Snively, of Lebanon; Samuel McCreary, of Lawrence, and Dr. M. E. Conard, of Chester.

MR. HERR: The Advisory Committee is selected by the Executive Committee in their meeting.

The CHAIRMAN: Yes; that is correct. The next thing in order, I suppose, would be Unfinished Business, as we find it on the program. Is there anything you wish to take up?

The SECRETARY: There is no unfinished business at present that I am aware of.

The CHAIRMAN: If there is none, the next thing in order is Miscellaneous Business.

MR. CLARK: Mr. Chairman, does not the matter of fixing the next place of meeting come under this head.

The CHAIRMAN: I think that is under the head of New Business.

MR. HERR: Is it in order to select the place of meeting now?

The CHAIRMAN: I think it is, at the pleasure of the Board.

MR. HERR: Mr. Chairman, then I move that we proceed to fix the place of the next meeting of the Board.

The motion being seconded, it was agreed to.

MR. HERR: Mr. Chairman and Members of the Board: You will remember that at the meeting a year ago I recommended Lock Haven as a central place, where we could meet with the least expense, where the accommodations are excellent, and where we have our court house to meet in. I had quite a good many votes for that, but the Board decided to meet at West Chester. Now, I want to renew that motion, for several reasons: We have as good accommodations at Lock Haven as you will find anywhere, railroads center there, and it is not far from the State College. If you wish to make a draft upon the faculty of the State College for our institute round-up in connection with the Board meeting, we have opportunities of doing it. I want to state candidly, however, that I have been requested by Mr. Riddle, of Butler county, who is not here, to present the claims of Butler, and if the Board decides to take it west of the mountains, I shall be glad to favor Butler, but my impression is that we ought to meet at Lock Haven, and there will be no additional charges when we meet there. Before, we paid all the incidental expenses of the Board, I think, and I will guarantee that the prices will not be advanced.

The SECRETARY: I have a letter in my hand which I was asked to present to the Board. This letter is from our Brother W. H. H. Riddle, who seems exceedingly anxious that the next meeting should be at Butler.

MR. HUTCHISON: I have a similar letter from Brother Riddle, of Butler, in which he speaks of it being a beautiful town of 20,000 inhabitants. I am not presenting the place, but I will discharge the duty that he imposed upon me; the letter is similar to that mentioned by the Secretary.

MR. CLARK: Mr. Chairman, I would state that I also have a letter of a similar nature from Brother Riddle to which I call your attention as a matter of courtesy, which I cannot help but do, as he requests, and I, therefore, present this letter for your consideration.

MR. RODGERS: Mr. Chairman, I have had correspondence with Brother Riddle, stating the same thing and saying that he will make himself responsible that everything will be verified, and I would move that we meet there.

MR. SCHWARZ: Mr. Chairman, I want to hear from Mr. Martin on this question.

MR. NELSON: Mr. Chairman, a year ago I nominated Clearfield, and all that Brother Herr has said in regard to Lock Haven will apply to Clearfield. We have the best of railroad facilities, have one hotel, a new hotel, that will entertain a hundred members of this Board at \$2.00 a day, with a private bath in rooms, and with an assembly room in the building and all necessary committee rooms, and I will guarantee there will be no extra charges, and those rooms will be furnished free. The Agricultural Society has been invited there and I believe we can turn out the largest delegation of any county in the State. The institute work is booming up there, and our people would like to have the State Board visit them at Clearfield. The hotel is situated right across the street from the court house, but it will not be necessary to go across the street for an assembly room that will seat over three hundred people.

Mr. Sexton seconded the motion of Mr. Herr to meet at Lock Haven.

MR. McHENRY: I feel very much like supporting that motion to go to Clearfield, particularly on account of those baths; it would be so nice for members of the Board, but Brother Herr is located further down the river and I think there will be a little more water there. I want to second the motion of Brother Herr.

MR. MARTIN: Mr. Chairman, before offering other remarks, I will say that I am also in receipt of a letter from our good county chairman, Mr. Riddle, but I wanted to say explicitly that I have no choice of a place for holding this annual meeting; I have no personal choice. I have found in the past, with one exception, that this State Board is amply qualified and able to take care of the place of meeting, hence, whatever place in your wisdom you may name for this summer meeting, will meet with my hearty approval.

Clearfield and Butler each received a second.

MR. HUTCHISON: I move that we proceed to a vote.

The SECRETARY: Before proceeding to a vote, I want to second the motion to go to Clearfield.

MR. HERR. I want to say that I wrote to Mr. Riddle at once that I had committed myself to favor Lock Haven.

MR. HUTCHISON: We have had one round-up meeting at Lock Haven, but Clearfield has never had this honor, west of the mountains; and I would say concerning this hotel of Clearfield that it is a splendid up-to-date hotel. The court house is right across the street and they are good people out there, and they will treat you well.

The SECRETARY: I would suggest that the roll be called and each one vote his choice when his name is called.

The suggestion having been approved, the Secretary proceeded with the roll-call, which resulted in favor of Clearfield.

The CHAIRMAN: Clearfield having received the majority of the votes cast, I declare it as the next place of meeting.

MR. HERR: Mr. Chairman, no one place has received the majority, and I move that we proceed to another ballot.

MR. HUTCHISON: The Chair has already made his decision.

MR. EDGE: Has the Committee on Credentials reported?

The SECRETARY: It has.

The CHAIRMAN: We will withdraw that decision and take another ballot.

MR. HUTCHISON: Mr. Chairman, your idea is to have a majority of all the votes cast?

The SECRETARY: I will state that we have had no time to revise the roll since the report of the Committee on Credentials has been adopted, and whenever anyone whose name is called, who has not been re-elected, he will please not vote. I will call the roll this time by counties and then there will be no mistake.

MR. BLYHOLDER: I move you that the place receiving the highest number of votes be declared the next place of meeting.

MR. HERR: I would like to suggest that the place having the lowest number of votes be dropped from the list after the next ballot.

Motion seconded by Mr. Hutchison.

DR. CONARD: I will change my vote to Clearfield, if I have that privilege.

The CHAIRMAN: The motion before the house is to proceed to another ballot.

The SECRETARY: I think that Mr. Herr intended that that should be amended so that after this ballot the place receiving the lowest number of ballots be dropped.

Mr. Rodgers made the same motion just previously made by Mr. Herr.

MR. HERR: I move as a substitute, to drop the place receiving the lowest vote after the first ballot.

MR. BLYHOLDER: Mr. Chairman, I am willing to accept that. It seems to me that we are laboring at a disadvantage. We certainly have precedents establishing how the election should be conducted. I do not believe that we ever before required that the place should have a majority of all the votes cast.

MR. EDGE: Mr. Chairman, there is nothing in the by-laws that refers to the matter of our selecting a place of the next meeting at all.

The SECRETARY: In order that we may get out of the tangle that we are in, I think if Mr. Blyholder will withdraw his motion it will simplify matters. The original motion of Mr. Herr is capable of amendment.

Mr. Blyholder withdrew his motion.

The SECRETARY: The motion before us now is that we proceed to ballot, with the understanding that a majority of the whole number of members of the Board is sufficient to elect, and that after this ballot is taken, the place receiving the lowest number of votes shall be dropped.

This being agreed to, a ballot was taken, and the result announced by the Chair was as follows: Lock Haven, 5; Butler, 15; Clearfield, 17.

A second ballot was then taken, and the result announced by the Chair was as follows: Butler, 16; Clearfield, 21. Clearfield having received the majority, was declared to be the next place of meeting.

MR. HUTCHISON: Mr. Chairman, I move that we do now adjourn.

The motion was seconded and agreed to. Whereupon, the meeting adjourned to meet again at the designated hour as per program.

Wednesday Afternoon, January 24, 1906.

The hour of 1.30 o'clock having arrived, the meeting was called to order by the Chairman.

The CHAIRMAN: Dr. Funk, who was not present this morning, I see is here, and we shall be pleased to hear his report at this time as Pomologist.

The report of Dr. Funk is as follows:

REPORT OF THE POMOLOGIST.

BY DR. J. H. FUNK, *Boyetown, Pa.*

As State Pomologist it affords me pleasure to render such a favorable report to this honorable body on the fruits of Pennsylvania.

In former years the State of New York was recognized as the great fruit belt of the United States, but gradually other states forged to the front in strong competition. Among the most prominent in the old Keystone State, which in almost every business enterprise stands pre-eminently in the lead, her agricultural interests compare favorably with the great West. In coal and iron she stands in the front ranks, and a few years more of progress such as made in the last half-score years will place her in the lead as the great fruit-producing state, leaving her competitors far in the rear.

A few years back the southwest had a boom. We heard of large areas being planted, thousands of acres being put into apple and peach, and the owners looked forward with bright anticipation of amassing stupendous fortunes in a short time, and Ben Davis was to be the stepping-stone to the new realm. Air-castles were built that

towered to the skies. But the bauble has burst, their walls have crumbled to dust, failure has followed failure for a series of years, until hope deferred has made the heart sick, and the once enthusiastic planters have come to realize that unless fortune favors them they must put their land to other uses for which it is better adapted.

The past season will be recorded as one of very small crops, of inferior quality of fruit throughout the fruit-producing states, New York and many other states averaging less than twenty-five per cent. of a full crop. Pennsylvania alone, especially that portion lying between latitude 40 and 41, producing a good crop of every variety of fruit, commencing with the strawberry and ending with the apple.

When the farmers and fruit growers become educated and make the proper selection of varieties such as are adapted to their locality; ceasing to plant varieties of northern origin; planting only such varieties as originated in their own latitude or southward; knowing that the keeping qualities or life of the apple is shortened by being brought southward and proportionately lengthened by being moved northward; selecting and planting only such varieties as are of strong, robust habits; hardy in wood and bud, early, abundant, annual bearers of good sized fruit of bright red color and possessed of high quality; knowing that we cannot adapt the people to our product, but must produce such fruit as the educated tastes of our citizens demand, using as much care and intelligence in the selection as does the breeder of pure bred cattle; when they understand the nature and habits of the different varieties, their requirements as to soil location, elements of fertility, pruning, spraying, etc., an orchard can then be planted with far more assurance of success than with any of the cereals and with many times the reward. When orchards are thus planted and controlled by intelligent labor, muscle subservient to brain power, instead of trusting in signs and luck, then we will find Pennsylvania, and especially the central portion and southward, will be excelled by no like area on this green earth.

The average annual yield of apples in the United States is 176,000,000 bushels; annual yield in New York State, 24,111,000 bushels; annual yield in Pennsylvania, 24,060,000 bushels. Thus we see Pennsylvania lacks but 51,000 bushels of being the greatest fruit-producing state in the United States. If this branch was encouraged and fostered it would double the production in a few years.

The northern tier of counties, Susquehanna, Wayne, Lackawanna, Bradford, Tioga and others are especially favorable for apple production. With their thousand of acres of hillsides, which are bringing in comparatively little income, being often a taxable burden to the owner, could in a short time be made to blossom as the rose and bring prosperity and happiness to hundreds of discontented farmers. Hundreds of acres of land can be bought through any of these counties for \$10.00 to \$25.00 per acre.

Farmers are anxious to sell and try their fortunes elsewhere. Some farms are being abandoned, and unless the tide of prosperity changes and sheds her bright rays upon the community, it will be in the same deplorable condition as some of the farming districts of New England. Why is this? Because the present system of farming is unprofitable; the owners barely existing. Their children, to avoid the same continual grind, are anxious to rush to the towns and cities.

HOW CAN THIS BE CHANGED?

While attending farmers' institutes, I find the people are anxious for any information that will better their condition, and they take kindly to the idea of fruit raising and endeavor to obtain all the knowledge possible. But like all new departures, it takes careful handling to shed the proper amount of light. Yet I fully impress upon them the importance of going into it intelligently, letting them understand that success depends upon careful selection of varieties, fertilization, pruning and tillage. I believe I have, in the counties gone through, started the germ, that if it be properly nurtured, would convert these now almost useless hills into a veritable Garden of Eden.

But it is a deplorable fact that the great State of Pennsylvania which takes such kindly interest in nearly all of her industries, appropriating thousands of dollars for building up and maintaining them, has made no provision for the building up of the horticultural interests.

They have created the office of Pomologist, the emoluments of which is honor, empty symbols of sounding brass, for which the incumbent is supposed to devote days of his time answering hundreds of long letters of inquiry, furnishing his own stationery and having the pleasure of paying postage from his own pocket. Why is there not a Department of Horticulture or some provision made that the Pomologist can do honor and justice to his office. When the needy ask for advice why should they be turned down for lack of funds, when the banks are speculating with millions of State funds.

THE PEACH.

It is only within the last decade that Pennsylvania has gained any prominence in the production of this most delicious of all fruits. Maryland and Delaware were looked upon as the great peach-producing states, but a new era has come and Pennsylvania steps to the front as a peer to all other states in producing in quantity and quality, second to none and superior to the majority. Peach orchards are being planted in nearly every part of the State. There are many failures as this is a fruit that will not thrive under neglect. But where planted and intelligently cultivated they are bringing their owners princely incomes.

The peach requires different treatment from the apple and pear, being more tender, more subject to fungus diseases, requiring more cultivation, more pruning, less nitrogenous and more mineral elements of fertility, but space does not permit to enter.

THE PEAR

Is holding its own as a profitable crop in Pennsylvania. I am sorry that a great many of the finer pears are being dropped from the list, from various causes, and the oriental varieties are superceding them, being less susceptible to insect depredation, more productive, consequently more profitable. I feel that the man who has the courage to set out a Bartlett pear orchard and tend to it intelligently will have a bananza in a few years.

PLUMS.

This crop is not giving universal satisfaction. The fine European varieties no longer thrive and produce as they did a few years back, owing to curculio, black knot and fungous diseases. The American varieties do not have the good qualities to ever become a favorite dessert fruit. The Japan varieties are not fulfilling expectations, being less hardy in tree, short-lived and fruit poor in quality, they will never fill the place of the prunes and gages of the past.

CHERRY.

This fruit is not being so extensively planted as it should be, and the supply is becoming shorter yearly, especially of the sweet varieties. This seems owing to the unhealthy condition of the trees, very few surviving bearing age. The sour varieties seem to do well, bear heavy crops and sell at very remunerative prices.

SPRAYING.

This is one of the essentials of successful, profitable fruit raising, and the owners profits are measured by the attention he gives his orchard. With the endless varieties of insect foes and fungous diseases that infest every variety of fruit, spraying several times a year has become so necessary that the man who expects to raise fruit without spraying is a back number, and will soon be crowded out of the business, as the citizen of to-day has educated tastes that call for clean, perfect, high colored fruit of exquisite flavor and this can be obtained only by spraying.

HOW OFTEN MUST WE SPRAY?

For good results three times, and for best results four times: First, with lime, sulphur and salt, while trees are dormant; second, with Bordeaux mixture and an arsenite immediately after bloom drops; third, about ten days later with the same material; fourth, about the beginning of August. These four sprayings, thoroughly done, with a power that will maintain a uniform pressure of 100 pounds will be a guarantee of clean perfect fruit.

THINNING.

This is another essential for fine, large, perfect fruit of high quality. There is no other one thing, except spraying, that gives such satisfactory results. It does more, it adds longevity to the tree and makes it an annual bearer.

SAN JOSE SCALE.

This pest is on the increase and the efforts thus far made have had but little effect in holding it in check. Occasionally we find a man who, by determined and persistent fighting, has held it under control and has his orchard in good condition, while his neighbor who has apparently been using the same means has no success whatever, the scale having taken entire possession, defying all his efforts and his orchard is in a dying condition, being only a matter of a short time until the battle is over and he is out of the business. This causes us to pause and consider wherein the difference lies. There must be a cause and I feel safe in saying that there are two causes of failure:

The first being the operator not understanding his business and not having the proper appliances at hand has failed to get the combination desired. A good chemist takes no chances; he makes sure of the purity of his materials. He weighs out the exact proportion of each ingredient that is required to form a new compound, knowing that certain elements having a strong affinity for other elements combine with them, thus forming new compounds, but always in fixed proportions. For instance, water may be taken from a mountain spring, from artesian well, or from the depth of the ocean and each contain exactly the same proportion of oxygen and hydrogen. They may be impregnated with foreign substances, but the vehicle, water, is always the same. The air we breathe always contains the same amount of nitrogen and oxygen, even though it be loaded with poisonous gases. So in the preparation of lime, sulphur and salt, certain manipulations are necessary. You cannot form bysulphide of calcium by simply mixing together proportion of lime and sulphur. You must have heat and moisture and the length of time necessary for the chemical change depends upon the intensity of the heat.

One or two well conducted orchard demonstrations, using the best modern appliances that practical science has devised for the preparation and appliance of the material, conducted by a thorough practical man who knows when the preparation is right, will be more effectual in educating the farmer and fruit grower than fifty demonstrations improperly conducted in the same territory and the expense less.

Two years back I had the pleasure of addressing this honorable assembly on the San José Scale. I then recommended public orchard demonstrations, but had in mind a thorough up-to-date outfit. The United States might as reasonably expect to cope with some strong foreign power who is fully equipped with the heavy armored vessels and powerful guns of modern warfare, by using the old flint-lock gun and wooden vessels of Revolutionary times as can the fruit raiser expect to subjugate and hold under control the most powerful insect foe that ancient or modern times has ever had to combat. It is a fallacy for us to attempt to teach the farmer to prepare the lime, sulphur and salt in small kettles or dripped over an open fire, when we know that intense continued heat is necessary to bring about the chemical change and without this all labor and money is lost.

You may argue, we must come down and meet the farmer on his own grounds, that he may use such implements as he has on hand. Why does not the same farmer cut his grain and grass with the cradle and scythe and save the heavy expense of the reaper and mower? Why does he use the cream separator, feed from the silo and adopt other modern methods? Because practice and science tells him he must do so or drop out of the business. Can we as practical fruit raisers, as well as scientists, who are looked upon as teachers afford to come down to this level and leave a trail behind us marked by utter failure. Our reputation, the good of the cause, will not permit it. We have a foe to fight, the most subtle, the deadliest one that requires the very best intellect and implements of warfare to control. Then let us thus equip ourselves instead of holding demonstrations at every little out of the way place that no one can conveniently reach. Select some suitable orchard of fair size, convenient to railroad station, advertize for at least a two-day demonstration, go there with the most complete outfit obtainable,

prepare and apply continually that all comers and goers can become thoroughly and practically familiar. Spray at least one or more acres that it may stand as a monument or finger-board pointing the road to success.

Having, as I believe, the most thoroughly equipped plant in the State, perhaps in the United States, I held a public demonstration on December 12, in the Paragon orchards in Boyertown, where, in the presence of at least 150 prominent fruit raisers from six different states, we prepared several batches of 100 gallons each of lime, sulphur and salt, cooking by steam, furnished by a 15-horse power boiler with best improved methods of steam distribution, obtaining a perfect combination in 35 to 40 minutes. Full instructions were given during the time of preparation. In this plant, everything is done by gravity system, avoiding all the disagreeable and laborious parts. At this demonstration everything was done to a nicety as far as preparation of material was concerned, being free from all sediment, and the sprayer worked to perfection; no clogging of nozzles from start to finish. But the application was not as it should have been. Those who run the sprayer looked more to the display of the machine and its power, than thoroughness. Ten nozzles being used on two lines of hose, whereas for thorough work more than two nozzles on each hose is a waste of material. Can we control this enemy? Yes! Lime, sulphur and salt properly made and properly applied is thoroughly effectual.

OTHER INSECT PESTS.

Oyster shell bark louse is especially plentiful and destructive in Centre, Clinton and Sullivan counties; also scurfy scale. I also find San José Scale in every county I have been in, except Tioga; but not having had the opportunity of examining orchards very thoroughly there it may also be in some orchards. Codling moth is very plentiful, rendering it almost impossible to find fruit free from worms in those counties where but little spraying is done.

FUNGIOUS DISEASES.

Scab and other fungous diseases is also doing serious damage to both tree and fruit where there is no spraying. The "yellows" is doing considerable damage all over the State, and nearly every farm home has trees in the last stages of decline from this scourge, which has thus far defied all science.

I also found one orchard in Franklin county with several trees affected with what is known as "little peach." This, like the "yellows," has no known remedy except cutting out and burning.

During the reading of his report, Dr. Funk made the following remarks: Right here I had something called to my attention that I did not embody in this paper; it has been recommended spraying the peach in the Fall with the lime, sulphur and salt; I have heard a few complaints that where they have been sprayed in December that the buds on the most of these are now dead, so that it would seem that we have to leave the salt out in spraying the peach, as it is the chlorine in the salt that will do the damage.

The CHAIRMAN: What shall we do with this report, gentlemen?

On motion duly seconded, the report was adopted.

MR. NELSON: I would like to ask the Doctor if he knows whether the scale insects are carried by bees or not?

DR. FUNK: I think any insect or bird that flies will have a tendency to carry them; the bee seldom touches anything but bloom, but the robin and the sparrow are the two great carriers; they carry more than anything else.

The SECRETARY: I would suggest that we go through with all the reports on the program and then if there are any questions, let them come up after the reports are all in.

The CHAIRMAN: The next report on the program is from the Committee on Live Stock, D. A. Knuppenburg, Chairman.

The report read by Mr. Knuppenburg, is as follows:

REPORT OF THE COMMITTEE ON LIVE STOCK.

BY D. A. KNUPPENBURG, *Chairman.*

The reports of the United States Department of Agriculture show a very great increase in the value of farm animals during the past few years. This increase of value has been accompanied in Pennsylvania by an increase in the number of dairy cows. There is also a larger number of horses and mules in use in Pennsylvania than ever before in the history of the State, even when street cars were drawn by horses. The value of the domestic animals of the State, including poultry, etc., animals in towns and cities as well as those on farms, amounts to fully \$150,000,000. Parts of the State are splendidly adapted to rearing horses and the experience of many farmers shows that horse raising may be conducted profitably.

Pennsylvania is probably the greatest horse and mule consuming state in America, and the market for good horses of all classes is as good here as it is anywhere in the United States. Unfortunately, however, this industry is by no means strong. It cannot become strong until horse raisers show better appreciation of the demands of the markets and use better stallions. It is a deplorable fact that there is in service in this State a great many stallions of mixed and cross breeding and that are afflicted with hereditary defects of conformation and are unsound. That such stallions are used is a very serious reflection on the judgment of the horse breeders of the State. Pennsylvania cannot take high rank as a horse producing state until there are available in all breeding districts, better bred stallions of high quality. Some of the Western states have inaugurated a system of licensing stallions and so far as this plan has been carried out it appears to be working satisfactorily and is improving the quality of the horse stock.

The horses of Pennsylvania are constantly threatened by glanders, as a result of the extensive infection of horses with glanders in some

of the Western states. Horses coming from such states may at anytime introduce this disease. There is also a great deal of danger with relation to second-hand horses from New York City, for in that city glanders prevails very extensively. The State Live Stock Sanitary Board has thus far been able to control important outbreaks of glanders before they have gained much headway. In order to do this it is necessary that the Board shall have reports of the early occurrence of this disease. In fact, a recent state law makes it compulsory upon owners of animals to report outbreaks of infectious diseases that may exist and be of serious damage to a community.

The mule can be raised at less expense and less risk than the horse. The demand for him being just as great and at a better price, no one need fear overstocking the market with good heavy mules.

Pennsylvania continues to import from other states, chiefly from Ohio and New York, about 15,000 dairy cows every year. The \$600,000 that is paid for these cows might be had by farmers in parts of Pennsylvania that are admirably adapted to the rearing of cattle, and where the dairy industry is now highly developed. I have discovered where milk shipping comes into vogue in a community, all other branches of agriculture have a tendency to decline until finally the sole income of the farm is derived from the sale of milk. Nothing is grown excepting for the use of the cow stable, and even the cows themselves, and often times the butter used in the farm house, is purchased.

Such a state of affairs tends to make farm life less attractive than when there is a greater diversity of interest, and in districts where this system prevails there appears to be an increasing tendency to turn the farm over to tenants. The addition of swine, poultry, a small flock of sheep, a colt or two all tend to create interest and the result is more satisfactory to those thus engaged.

The diseases that have long been in the State have continued to prevail, although to a less extent than formerly. Abortion of cows is a disease that is causing very great losses in breeding herds, and for which there should be a better means of controlling. The State Live Stock Sanitary Board is anxious to take up the study of this disease and also of calf cholera, a very fatal and destructive malady. At present, however, the full resources of the Board, so far as they are available for investigation, are being devoted to the development of vaccination against tuberculosis.

Great success is attending this work, and already vaccination is being used under the direction of the State Live Stock Sanitary Board in a number of important breeding herds. The plan is to make this process generally available just as soon as sufficient knowledge is at hand to show to what extent it may be relied upon under different systems of herd management. Loss in Pennsylvania the last year from disease is two per cent. The Federal Meat Inspection Statistics, which cover about 6,000,000 cattle a year, show that the condemnations on account of tuberculosis are increasing from year to year at a rate that must cause anxiety to every one interested in American agriculture.

An official report declares that for years to come there will be more money in sheep than in any other agricultural product and that the Pennsylvania farmer is in position to profit by this condition. The reason why sheep raising is to be found so profitable is

that flocks not only of Pennsylvania but of the world are declining at an alarming rate. Pennsylvania State Veterinarian, Dr. Leonard Pearson attributes this decrease in Pennsylvania largely to ravages of dogs. As the State becomes more thickly populated, more dogs are kept in the same centers of population, about industrial establishments, coal mines, summer resorts, worthless country dogs, etc.

The loss of the flocks to the world from various causes, in the last thirty years shows a loss of no less than 93,000,000 head, an average of more than 3,000,000 a year. It may thus be seen what an immense field of enterprise is open to the farmers of Pennsylvania in a single agricultural product. Dogs have ravaged the flocks of Pennsylvania to a very discouraging and disastrous extent. It has not yet been possible to secure effective legislation on this subject, and it is one that merits the earnest attention of the State Board of Agriculture. Heretofore, there has been several general discussions on this subject, but the discussions have not resulted in definite action. If the strength of the Board of Agriculture could be brought to bear in favor of a given bill, it is likely that the passage of the bill could be obtained at the hands of the Legislature.

No one should be permitted to keep a dog that is not worth paying taxes on. The dog tax should be more carefully assessed, and the penalty for non-payment should be the destruction of the dog. It might be well for the State to inaugurate a system for licensing dogs as is now done in some cities. In this case the dog has to wear his license in the form of a metal tag attached to the collar.

Poultry may be raised with the greatest economy on the farms of the country where there is unlimited range and exhaustless supply of insects and worms, and an abundance of seeds and grains going to waste which poultry alone can utilize. When fenced away from the garden and flower beds, it does little damage and causes scarcely any annoyance on a farm. Gapes in chickens are the greatest drawback and the poultry raiser is anxiously looking for an effectual remedy.

Pennsylvania has 1,200,000 swine. Where good sanitary conditions exist, with plenty of clover, milk, charcoal and good common sense, energy and thrift, there is little doubt but swine are profitable and little troubled with disease. It is much better and cheaper to prevent disease than to cure it when once contracted.

On motion, duly seconded, the report was received and placed on file.

The CHAIRMAN: The next on the program is the Report of the Veterinarian, Dr. Leonard Pearson, of Philadelphia.

Dr. Pearson not being present, his number upon the program was passed.

The CHAIRMAN: Mr. Nelson, who is Chairman of the Committee on Apiary, prefers to report to-morrow morning.

Dr. Edward Patrick, of West Chester, Pa., not being present, his number on the program was passed.

Mr. McHenry, third vice present, at this point took the Chair.

The CHAIRMAN: Next upon the program is the Report of the Committee on Roads and Road Laws, P. S. Fenstermaker, Chairman. We will now hear from Mr. Fenstermaker.

MR. FENSTERMAKER: Mr. Chairman and Members of the Board: I have an apology to offer to the members of this Board. I would like to have this report just one-half as large as it is, but it is such an important question, one of the widest questions I think in our State, that I have not been able to keep my paper within the limits I would like, and whenever you get tired, let me know and I will quit right there.

The following is Mr. Fenstermaker's report:

REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS.

BY P. S. FENSTERMAKER, *Chairman.*

Your Committee would report that there are now among the statutes of Pennsylvania road laws which embody many of the features recommended by this body. We believe that if those upon whom rests the responsibility of carrying out its provisions will faithfully do their duty, a new era of road improvement will have dawned upon our Commonwealth. We find, however, that the people are hesitating and uncertain as to how to proceed. No one seems anxious for the position of township supervisor, and for once this office will have to seek the man.

We have heard of townships where meetings have been held resolving that they would continue upon the same plan as heretofore, and pay no attention to the new law. The acts of 1905, repealing former laws, all proceedings under such circumstances will be illegal, and such as will follow this plan will soon find themselves in a dilemma. The success or failure of road improvement under these new laws, depends principally upon the *personel* of the men selected for position of township supervisor. Unless the best men in every township interest themselves sufficiently to put in operation the provisions of these acts of the Legislature, the taxpayers as well as those having occasion to use the highways will be in worse shape than ever before.

As to the State aid reconstruction acts, the State Highway Commissioner, Joseph W. Hunter, reports that this department has received five hundred applications, aggregating nearly one thousand miles of road, about two hundred miles completed, and surveys made on many miles more. The State Highway Department claims to have found less objection to the State aid system. The opposition decreasing in proportion as the public becomes familiar with the provisions of the law and with the character of the roads built by authority of the law. That townships which first applied for State aid have been so well pleased with the results that they have sent in numerous additional applications.

Through information received from different sections of the State we find that many differ with the State Highway Department in several particulars, as to the results of the State aid reconstruction laws.

It appears that in rural districts the want of information and lack of interest in road improvement, with the low valuation of real estate, causes these people to hesitate and halt before applying for State aid, especially when reconstructed roads are reported to have cost from two to five thousand dollars per half-mile. For with many more miles remaining untouched for many years to come those not having any benefits of the improvement will hardly tax themselves for another's benefit.

The result is that the people living in strictly rural townships will hardly become beneficiaries of the State aid. They put in no application, and the roads adjacent to cities and towns are put in good condition, enhancing the value of land near cities and towns, while the rural roads will remain in about the same condition as heretofore.

Suburban communities are availing themselves of the State appropriation, and from present indications will get the largest share of the road fund. This result is also brought about through natural conditions to a certain extent. The principal roads near cities and large towns and railroad stations are being the most traveled in nearly all communities, and are naturally the ones on which to begin reconstruction.

Now in order to have sufficient funds for road improvement so that the strictly rural townships, which are at present taxed to the limit, need not pay the proportion of the cost as at present, might it not be well to have an investigation of the taxation of railroads, oil, telegraph, telephone and trolley lines, as to the valuation and other questions. These interests should pay the same proportion of taxes as is paid by other property holders. Another means of assistance in road improvement could be secured by compelling our thousands of convicts to work on the highways instead of competing with honest mechanics in the different trades. These convict laborers could be guarded by the recently organized State Constabulary thereby making this organization useful as well as ornamental.

In view of the fact that for generations to come there will yet remain many highways unreconstructed in the rural districts, and that as the State aid fund should benefit all sections of the State regardless of their ability to pay their share towards macadamizing under State supervision, we recommend that the pro rata share of each township not applying for State aid, and which under the present laws reverts back to the general fund, be, instead, allotted to all such townships upon the same plan as now is the school appropriation, and to be applied for the betterment of their highways, with certain restrictions, and on a plan of operation similar to that introduced by the Mapes Good Road Club, of Middletown, New York.

This system of road improvement appears to be the next best method to the macadam and at about one-thirty-fifth the cost. We consider it of such merit that it is included in this report, and with the hope that a copy of the same may reach every township supervisor in the State. The plan of operation is as follows: The first step is to stake out the work by making a light furrow on each side of the proposed road-work 12 to 16 feet apart, according to the width of the road. Next put the wheel of the road machine in this light furrow, hold the point of the blade firmly down in place, remove every

stone which the point strikes and work down and out, until enough dirt is secured to bring a good crown to the center of the road and a good gutter on each side, making suitable outlets from all low places in the gutter. On portions of the road with proper care in honing down after each heavy rain, and raking out loose stones this will be sufficient, other portions will need a little gravel or shale along the crown of the road. A cubic yard hauled on a twelve-foot wagon is enough for the worst places by dumping in a full load in a place, and in other places a half or a third of a load in a place will finish the crown. Grading with the machine should not cost more than twenty-five dollars per mile. Hauling gravel on the crown of the road not more than forty cents per cubic yard. This makes the cost only two hundred dollars per mile where a full load of gravel is placed on the crown of the road all the way.

The secret of success of such a road is the after-care. After the first rain such a road will become cut up by passing teams and vehicles, forming a hard crust as it dries. Before this becomes too hard, hone the surface perfectly smooth and true with a light hone about five to six feet long. One man and a team can hone off a piece of road in this way if he understands his business, at a slight cost. He should stand on the hone, and guide it by stepping from one end of the hone to the other as the occasion requires. This should be repeated after every heavy rain. Now rake off any loose stones and you have a beaten track on the crown of the road over which an auto or bicycle will roll as smoothly as on the best macadam, and on which you can drive a clean buggy an hour after a summer rain shower without having to avoid mud holes. The only care needed on such a road will be to sprinkle a very little gravel shale on even good hard pan right on the center of the beaten track occasionally according to the amount of wear on the road. Keep the gutters from filling by throwing the stuff out of them away from the road instead of back into it.

A road so built and kept is built on scientific principles. The beaten track on the crown is a hard crust almost impervious to water. Using the hone frequently keeps the upper surface of the crust so smooth that rains flow quickly into the gutters at the side. A road thus built and at this cost has stood the test for over two years, and is still in almost perfect condition. The thawing of last winter's frost seemed to have no bad effect on it last spring, though formerly it had often been almost impassable.

This hone which is used for scraping roads is a plank twelve inches wide, three inches thick and five or six feet long, to one side of which is bolted a plate of steel for a cutting edge. It is then stood on edge and a pole fitted to the front with braces arranged so that it will draw a little diagonally across the road. A pair of plow handles may be fitted back of the scraper by which it can be guided, or weighted by the driver standing on it.

With State aid the first cost of such a road is within the means of most rural townships.

RECOMMENDATIONS.

The recommendations in last year's report as to the encouragement of the use of wide tires on the public highways are renewed, as are also the same as to penalty for hauling of heavy loads with narrow tires.

Our Legislators in the session of 1905 should be highly commended for the enactment of laws placing restrictions and responsibilities upon those having charge of auto vehicles upon the public highways.

We recommend, as an additional safe-guard, that this act be amended so that all such persons being above the age of eighteen years be compelled to pass a satisfactory examination as to their capabilities of running such machines and prove their ability of controlling the same before some legally constituted board of examiners before being given a license.

The present agitation of the question for the enactment of laws permitting trolley cars or lines to carry freight is one which should have our serious consideration. For unless such a law is properly constructed its operation may prove a curse instead of a blessing.

The term freight is entirely too sweeping, and unless there is specifically defined what class of articles this shall consist of, we may, by our blind encouragement of this project, be the means of making our already crowded and dangerous highways upon which trolleys are running, still more dangerous and almost impassable for the horse conveyances.

In many sections of the State the tracks of trolley lines are almost exclusively upon the public highways, and to still further encumber them with additional tracks and with trains of cars containing coal, lumber, ores, oils, explosives and such other articles as are included in the term freight would be the height of folly.

To bring up a discussion on this very important question, we would recommend that this body pass suitable resolutions, and through our Committee on Legislation, oppose all bills brought before the Legislature permitting trolley lines to carry freight, that do not limit the articles to be carried to the products of the orchards, dairy, poultry, market gardening, etc., and what is known as light freight and express packages. Also that such trains shall not consist of more than one car, and such cars to be of same style and size as are in use at the present time.

Your Committee would request that all of the aforesaid recommendations receive the consideration of the Committee on Legislation.

On motion duly seconded, the report was adopted.

The CHAIRMAN: The next number on the program, is the Report of the Committee on Wool and Textile Fibres, D. S. Taylor, Chairman, of Raccoon, Pa.

Mr. Taylor then read his report which is as follows:

REPORT OF THE COMMITTEE ON WOOL AND TEXTILE FIBRES.

BY D. S. TAYLOR, *Chairman.*

I beg leave to submit the following report on wool and textiles. In looking over the reports for the past five years, we do not find recorded any report from this department. In order to make a re-

port on the wool industry of the State, it is but fitting that we take with it the sheep industry also, as without the sheep we cannot grow the wool. We find from statistics, the State of Pennsylvania had on January 1, 1905, 895,982 sheep, valued at \$3,415,394, average price per head of \$3.81; and in the United States of America on January 1, 1905, 45,170,423 sheep, valued at \$127,331,850, average price per head of \$2.82.

The wool product of Pennsylvania for 1904, was from 850,000 head of sheep, producing 5,100,000 pounds washed and unwashed wool, 2,448,000 pounds scoured wool, there being .52 per cent. of shrinkage; average weight of fleece, 6 pounds. The wool product of the United States in 1904, was from 38,342,072 head of sheep, 249,783,032 pounds shorn, washed and unwashed fleece, 42,000,000 pounds pulled wool, 291,783,032 pounds of wool produced in United States in 1904.

Scoured wool: Pounds, 95,795,147 fleece or shorn wool; pounds, 28,140,000 pulled wool; 123,935,147 pounds scoured wool.

Per cent. of shrinkage: In fleece or shorn, 61.6 per cent.; in pulled wool, 33 per cent.; average weight of fleece, 6½ pounds.

We find the number of sheep in Pennsylvania: In 1903, 850,000 head produced 5,100,000 pounds wool valued at \$1,297,440; in 1904, 850,000 head produced 5,100,000 pounds wool valued at \$1,419,480; in 1905, 850,000 head produced 5,100,000 pounds wool valued at \$1,542,240. The increase in the value of the 1904 over 1903, \$122,040; the increase in the value of the 1905 over 1904, \$122,840.

The average value per scoured pound: October 1, 1903 was 53 cents; October 1, 1904 was 58 cents; October 1, 1905 was 63 cents.

It appears the number of sheep and the average weight of fleece, have changed but little in the past three years, but the value per scoured pound has increased. It is evident the sheep breeders in Pennsylvania are breeding for more wool and less oil or grease in the fleece. In years past the sheep-breeder and wool grower, especially the fine wool breeder, bred for weight of fleece alone and did not keep in view the size of sheep. The result of which was a heavy oily fleece and delicate sheep. The fleece would loose much more than 60 per cent. in scouring.

The tendency in the sheep and wool industry in the western part of the State, is to grow more wool and less oil in the fleece. And as mutton is a good price, to produce a large sheep, smooth in body, and will produce a good long, medium fine fleece of wool. The sheep weighing 110 to 120 pound at 2 years old in April with the wool off. The average weight of fleece being about eight or nine pounds.

This grade of wool in our county the past season sold at 33 cents and 35 cents per pound (brook washed).

The wool industry in my county (Washington) is fast decreasing. Twenty-five years ago, the county produced more and better fine wool, than any other county in Pennsylvania. Then every farm was stocked with fine wooled sheep, about three sheep per acre, besides some horses, a few dairy cows and hogs. Some twenty-five or thirty years ago, two young men in our part of the State emigrated west, going into the State of Kansas, taking with them a choice lot of fine wool sheep from the western part of the State of Pennsylvania. They kept the sheep for over a year, shearing them, then they shipped the wool to Pennsylvania to be sold. It was in a wool house in a town in Washington county and on examining the wool,

good judges of wool would hardly believe, when told that the wool was grown on sheep, bred and raised in Western Pennsylvania. The length of staple was much shorter and the wool was full of a gray sand which colored it. This wool could not be sold for the price which it would have commanded if it had been grown in Western Pennsylvania. So it appears that parts of Western Pennsylvania are well adapted to growing good wool.

But from present appearances in Washington county those engaged in the sheep and wool business will have to direct their attention to some other business. With the development of the gas or soft coal it is bringing into the western counties of the State, a population of miners and with that population about two hungry, worthless dogs per family, the owners of which are moving from one mine to another and do not pay any tax on the dogs or if they remain long enough in one place, to have a tax assessed against the dogs, the collector is unable to collect it as there is nothing he can levy on unless it would be a house full of ignorant children. And the result is we do not get any revenue from the owners of a majority of the dogs to pay the loss sustained by the flock-master for his loss. In our county in 1904, the dog tax collected was \$5,656, but this was insufficient to pay the loss to the flock-masters.

We say, if the sheep-breeder and wool-grower cannot have better protection to his flocks from dogs by better legislation in the State of Pennsylvania, they will be forced to give up the business of breeding and growing sheep and wool.

Mr. Taylor called attention to the fact that he had samples of wool upon the table, representing wool from various kinds of sheep, each sample tagged to show from what kind of sheep it came, which he invited any of the members present to examine.

On motion, duly seconded, the report of Mr. Taylor was adopted.

The CHAIRMAN: The next number on the program is entitled "When Shall We Leave the Farm?" by Mr. E. E. Chubbuck, of Rome, Pa.

The following is the paper read:

WHEN SHALL WE LEAVE THE FARM?

BY E. E. CHUBBUCK, *Rome, Pa.*

It is with much hesitation that I even attempt to address this audience, but I have been so impressed with certain conditions that I venture to present a few thoughts.

You are all familiar with the fact that throughout the New England states, as well as our own and adjoining states, there is a vast number of rented and abandoned farms. In a certain village in New England an abandoned church lifts its spire among a cluster of abandoned homes. The vacant store keeps company with the empty blacksmith shop. The silent street hears no footfall, and

the neglected fields are left to the birds, the bees and the briars. Where are the children of these homes? Gone to the city. The fathers and mothers have either gone to the city of the dead or lost heart and left the home that could only tell of past joys and gave no promise for the future. The thought I wish to call attention to is—Shall we leave the farm? Shall we train and educate our children for the farm or fit them for other walks in life? If we wish to make them dissatisfied with farming as an occupation I know of no better way than to inculcate in their minds the idea that of all men on earth the farmer is the most oppressed.

I believe two erroneous ideas of the farmer is prevalent. One is that the farmer is a little inferior to every other rank in life. The other is equally untrue and fully as dangerous to our boys and girls. It is the idea set forth from the picnic platform, etc., namely: That the farmer is the noblest work of God; only till the soil and you will in some way become imbued with every virtue known to mankind. They throw a halo around his rough garb and uncouth manners. Now I believe we must teach our children that a man is a man, be he farmer, lawyer, merchant or priest. That a man is no worse for being a lawyer nor no better for being a farmer, no worse for being a poor man nor better for being a rich man. How better can I illustrate this than by quoting Robbie Burns:

"What tho 'on hamely fare we dine,
Wear hoddie-gray, and a' that;
Gie fools their silks, and knaves their wine
A man's a man, for a' that!
For a' that, and a' that,
Their tinsel show, and a' that;
The honest man, though e'er sae poor,
Is king o' men for a' that!

"Is there, for honest poverty,
That hangs his head, and a' that?
The coward-slave, we pass him by,
We dare be poor for a' that!
For a' that, and a' that,
Our toils obscure, and a' that;
The rank is but the guinea's stamp,
The man's the gowd for a' that!"

When we have taught them these things we have instilled into their minds some of the fundamental truths underlying a useful life.

I see no reason why a farmer should not look as well as other men. His work should give him a fine physique. Overalls and heavy boots are well adapted for the plough field and barnyard, but while I have often perceived a strong odor, I have never discovered a halo about them. Some farmers seem to have such an exalted sense of the greatness of their calling that they deem it unnecessary to pay the slightest regard to their personal appearance and then feel injured that others could not see through the two weeks beard, uncut hair and every day clothes and recognize their great worth of character, but preferred another simply because he had "more style." The boy of to day to make a success on the farm needs all that the successful merchant needs. Give it to him and what can the town offer better than the farm. The clerk must work long hours in the store. He can work just as long as he wishes on the farm.

The clerk may have a greater money income, but his expenses keep apace, he must be subject to the will of other men but the in-

dependent farmer executes his own plans, at the end of the year the clerk has payed his assessment on his life insurance policy and the farmer has made a payment on his farm.

The girls, who should stay with their parents and be educated and trained to become cultured women and makers of homes, attracted by the wages and seemingly easy life of the city stores and offices, leave home before they have learned even the rudiments of good housekeeping, and if in time they form attachments and attempt to make a home, their reluctance to let anything come into their life that will confine them at home and their meager knowledge of the essentials necessary to the making of a home, namely, the care of a house and the proper preparation of food, soon bring about discord and the end is too often, the divorce court. For with Owen Meredith we may say:

"We may live without poetry, music and art;
We may live without conscience, and live without heart;
We may live without friends, we may live without books;
But civilized man cannot live without cooks.

"He may live without books,—what is knowledge but grieving?
He may live without hope,—what is hope but deceiving?
He may live without love,—what is passion but pining?
But show me the man that can live without dining."

The trend of educators and of many periodicals have been to encourage the education of young women so that they may earn an independent living; but it has worked for evil instead of good, inasmuch as it has unfitted them for home life, because of impaired health and love of dress and excitement. The young man must compete with cheaper female labor and accept such wages as will not justify him in asking the girl of his choice to give up her independent life and share such a home as he can provide. The result is unnatural, and detrimental to good morals. It seems to me that one reason our boys and girls are so ready to leave the farm, is that we give so little attention to the beauty of our homes. Ride through the country where you will and you will see homes built as plainly as the architect could devise, not a vine to hide its bareness, not a tree to relieve its bleakness, no thought given within or without to the aesthetic side of our nature. Again you find homes that nestle among the hills as beautiful pictures surrounded by well-kept lawns, trees and shrubs. The vine covered porches tell of rest and contentment, the whole place showing that the comfort and enjoyment of his family was ever in the owner's mind. Doubt you for a moment that that home has a stronger hold on the boys and girls than the bare cheerless farm house, no matter how large the bank account? If we train our children to think money is the only measure of success, when the town offers more money, the farm has no charm for them.

Rather teach success as defined by another: "He has achieved success who has lived well, laughed often and loved much; who has gained the respect of intelligent men and the love of little children; who has filled his niche and accomplished his task; who has left the world better than he found it, whether by an improved flower, a perfect poem or a rescued soul; who has never lacked appreciation of earth's beauty or failed to express it, who has always looked for the best in others and given the best he had; whose life was an inspiration, whose memory a benediction."

I have in mind a certain locality in my own county noted for its beautiful homes and well stocked farms. There is no special market to account for their success, but the owners put their profits back into their homes and farms. The houses are heated with furnaces, supplied with water, bath rooms and modern conveniences, and in nearly every instance a son has staid on the farm. What did the town offer that they did not have, and how much of independence, health and contentment the farm offered the town could never give. Then shall we advise our boys and girls to leave the farm? No, for their chances of an upright useful life seems to me far greater there than in the crowded towns, where success is often achieved by the sacrifice of conscience. Now if we have made the farm so attractive to our children that we can have some one to help bear the burdens as life reaches its meridian, then it seems to me we are ready to enjoy the fruits of our labor and we will have no wish to leave the farm, for the habits of an active energetic life are fixed and to become an idler and oftentimes a bore to business men, holds no temptation to us, and is usually disastrous to health. Where there is no child on which to depend, the scarcity of help on the farm and in the house make the management of the farm a serious matter. What is the solution of this problem? Can we draw help from the shops? Shall we try the 'heathen Chinee with his ways that are dark and his tricks which are vain? Many claim that they make the best of farm laborers. If so, speed the time when the immigration laws are so changed to give us this much needed help.

Perhaps the lesson we must learn is less acres and more fertility. Meet the dilemma of farm help in the field and in the home and I say the time has not yet come to leave the farm.

Now comes the sunset of life with its failing strength. To leave the farm now means to leave the associations of a lifetime. Every tree and rock has become old friends. Every tree reminds him of the planting when his wife stood by his side, not a gray haired woman, but a sweet girlish form. The home has grown and become beautiful by their combined efforts; to leave it means to leave their personality behind them. The crowds of the city are pandemonium. The ways are strange and their days are saddened and shortened by the longing for the old home with its fertile fields and running brooks. Where the peepers were the orchestra that lulled them to sleep and the birds gave the signal that the morn had come. Shall we leave the farm in old age? No, I say again. Let us go back to our homes and make them delightful as possible. Let us educate some of our boys at least in our agricultural colleges. Let us teach our girls that to be a true wife and intelligent mother is the crown of womanhood. Let us put so much of our enthusiasm and enterprise into our business that we will never need to ask: When shall we leave the farm?

On motion duly seconded, the report was adopted.

The CHAIRMAN: Questions are now in order; Dr. Funk's paper was the first on the program.

MR. HERR: Mr. Chairman, would it be in order to offer a resolution at this time?

The CHAIRMAN: I see nothing to prevent.

MR. HERR: Mr. Chairman, I offer the following resolution:

"Resolved, That the State Board of Agriculture hereby endorses the bill (H. R. No. 245) introduced into the House of Representatives by the Hon. H. C. Adams, of Wisconsin, to increase the National appropriation to the Agricultural Experiment Stations, and requests the Representatives of Pennsylvania in the Senate and House to use their best efforts to secure its passage.

"Resolved, That the Secretary be instructed to send a copy of these resolutions to the Hon. H. C. Adams, to the Hon. James Wilson, Secretary of Agriculture, and to each Senator and Representative from Pennsylvania."

I move the adoption of the resolution as read.

The motion was duly seconded and agreed to.

The CHAIRMAN: Now if there are any questions on the report of Dr. Funk, we would be glad to hear them.

A Member: I would be glad to ask Dr. Funk if the lime, sulphur and salt remedy is adapted to all scale insects.

DR. FUNK: Yes, it will answer equally well on the oyster shell, scurfy scale and every scale I have tried it on.

DEPUTY SECRETARY MARTIN: I notice in your paper you spoke of the boiling of lime, sulphur and salt, and its coming to a proper condition, will you please explain that a little more fully?

DR. FUNK: There is a considerable misunderstanding on the part of the majority of the people as to the cooking of that lime, sulphur and salt. You find in all the papers and in all the bulletins, or almost all of them, a certain given time stated to cook it; some state three-quarters of an hour, and some an hour, but as to that, you can have no set time, at least that is my experience. You may have the combination you want in thirty minutes' time, and it may take you three hours. Years ago it was cooked for eight hours in the name of the old Oregon mixture; this is nothing new at all, this lime, sulphur and salt. The description given then was—they were told you to cook it until it becomes an amber color. That is very unsatisfactory. You will find that you may cook it as some may tell you for an hour, and you leave it stand, and you will find that you have a copper colored liquor coming to the top, yet if you look you will find that it will never become dissolved properly. You mix that up, and it is a very unsatisfactory preparation and not effectual for the purpose, but to have it do its best, you must cook it regardless of time, until it passes through all the changes. First, it starts with the lime, and when you get the sulphur in, it will become yellow, and you cook it until it will gradually turn an orange, and then it will come to a tomato color, like dark tomato catsup, and then it will turn to about a leaf green; it is then ready to be applied. I have never seen a single instance when it was in that color and condition that it did not entirely destroy the scale, if properly applied.

MR. HERR: What is your proportion?

DR. FUNK: Forty-four pounds of lime, thirty-five pounds of sulphur and fifteen of salt to the hundred gallons. I think we will have to leave the salt out in the treatment of the peach; the peach is very susceptible. I just had a gentleman come to me this morning who told me that he was recommended to apply the lime, sulphur and salt, and he used it in the proportion of 22, 10 and 50 and he said it not only destroyed the buds, but on all the young trees that were planted last, it destroyed the terminals back anywhere from six inches to a foot. In the trees that have been growing for about two years, it has not injured the terminals but has destroyed the buds in nearly all of these.

I have found that where I sprayed in the beginning—I have found that some of the terminals there, are injured by the lime, sulphur and salt so that I would advise leaving the salt out in peaches. I believe it preferable to leave the trees without spraying until the buds begin to expand.

The SECRETARY: I would like to know whether your apparatus is portable.

DR. FUNK: No, most of my fixtures, except the spraying outfit itself, are stationary. You see I have a fifteen-horsepower boiler which is stationary, and different series of platforms. Here is the driveway, for instance (indicating), and here is the first platform; that would be seven and a half feet high; there is a wide platform on which the mixing tanks are placed; that is three feet and a half above, and here is a longer platform (indicating) where the cooking tanks are; back of that is the boiler which creates the steam by means of which it is cooked, through the distribution of steam through pipes. Then it is run into the mixing tank and there diluted; everything is done by gravity; it is diluted to the consistency we want, from there it is run by gravity again through pipes into the tank on the wagon; that is closed, and then we use the carbon-dioxide—doing away with all pumping, no pumps used at all.

The SECRETARY: Have you ever seen an apparatus that is portable or could be made portable that would answer the purpose just as well? You have my thought. I want to know of something that we can get around with to show the people how it can be done successfully.

DR. FUNK: Certainly it can be; this spraying apparatus can be put on two wheels, a fifty gallon size that can be pulled anywhere with one horse, or put on a two-horse wagon, and you can have it placed so that you can put the kettles upon it in such a way as to make it practicable.

There is another matter of importance that I want to mention. I believe that the majority of people understand or are instructed to slack their lime and strain it before it is put in to boil; that is certainly wrong. I speak of it for this reason, when you put that in to boil, you will get only a little over 212 degrees Fahrenheit. Now you will understand that you must get—when you put the lime in, you get an increase of heat that will run over three hundred degrees, which you will never get if you first slack your lime and then

put it in to cook. There are a great many minor details about this thing that if omitted in putting it into practice, will seriously interfere with your success.

MR. FENSTERMAKER: I think that the Doctor forgot to mention stirring.

DR. FUNK: Yes, but you will need very little stirring if it is in a kettle like I have. If you have it cooked in an ordinary kettle of course you would have to keep stirring. As soon as the lime is put into boiling water, you will have to have that stirred or else it will burn and stick fast, even though there is water above; you have got to stir that loose until it gets into a regular boil, then continue boiling until you have got the combination you want.

When we cooked at our demonstration, we had one cooking that only took about thirty-five or forty minutes and another in about forty minutes, and I am satisfied that you could have held all the sediment or refuse that was produced, right in your hand. You will find that you have very little if you have good material and cook it as it should be. We put a cover over it to keep the heat in, and then we run it under about a sixty pound pressure. Some will tell you that they can cook just as well with a five pound pressure but I have never been able to do it; I find that under a fifty or sixty pound pressure, I can do it a great deal quicker.

I would rather use the lime, sulphur and salt, or else as a substitute for the salt I would use blue vitriol; take the old Oregon formula. Wherever I have used that I have had splendid satisfaction. I believe you can use that as a substitute for the peach.

A Member: In what proportion?

DR. FUNK: For a hundred gallons I would use about six or eight pounds of sulphate of copper, but that would have to be in a very dilute form or else it will not mix.

A Member: Is that more expensive than the salt?

DR. FUNK: At this time that will cost you about six cents a pound, so that it would only cost you from about ninety cents to a dollar. We find that the sulphate of copper prevents it from washing off better than the salt does; that will form an insoluble compound. You know in the Bordeaux mixture it forms an insoluble compound, and it is much more difficult to wash off.

MR. RODGERS: Last summer where I was at when they put the lime, sulphur and salt together, it turned black instead of the color that you describe. Mr. Foster, who was sent out by the Department, said he had never before seen anything like that.

DR. FUNK: There is one thing I think should be attended to by the Department, and that is, to have the lime of different parts of the State analyzed so that we may know what a good lime is. We find that the majority of our limes are strongly impregnated with magnesia, and it takes considerably more than it would if we had a true calcium of lime.

A Member: You put the sulphur directly into the mixture?

DR. FUNK: Yes, we have three kinds of sulphur. We have a sublimated sulphur that runs 150 pounds to the barrel. We have a fine flour of sulphur—you see this other is called flowers of sulphur—then we have the fine flour of sulphur that runs 225 to 250 to the barrel. The sublimated is the best; it will make a combination a great deal quicker. The other is a rose sulphur.

A Member: You use the same in quantity?

DR. FUNK: Yes.

A Member: Does the oyster shell scale breed on any other trees than just fruit trees?

DR. FUNK: Yes, it breeds on the ash more than any other tree. I find them on a great many trees. People are often mistaken in what they think is the San José Scale. ;

The CHAIRMAN: Mr. Knuppenburg's paper is the next in order. Are there any questions on that subject or on any of the other papers or any discussion on them? We would like to hear from any of you on this question.

The SECRETARY: Mr. Hutchison would have some ideas on the horses of the State. I think it would be a pretty good idea for him to come to the front now.

MR. HUTCHISON: Mr. Chairman, I have thought that measures might be taken for the improvement of the live stock of our State the same as they are doing in foreign countries. There they are purchasing stallions and placing them out in different sections for breeding purposes. This is being done by the Government—I think it is Belgium, is it not, Mr. Secretary?

The SECRETARY: Yes, Belgium.

MR. HUTCHISON: These horses are kept a certain number of years in a certain section, and then transferred to another. Now why could not this be done by the great State of Pennsylvania? Why could not the State invest several hundred thousand dollars in this industry? Have these horses purchased through the proper channel and place them in care of the County Commissioners of the State and in this way we would improve the live stock of our State.

To-day we are drawing on the Western states for horses that are not the very best. They are horses that grow up without development, except in flesh and bone, and when they are brought into this State for use, a large number because of colds and other diseases, die.

If we had some system of this kind to improve our stock, it would be a great boon to the people of our State. We are getting means for our colleges and schools and for other departments, and why not have this taken up by the farmers of Pennsylvania and have some of this great surplus used to improve the live stock of our State? This may be a crude idea, but if it is practicable in other countries, why not adopt it in our country? I remember the time, not so many years ago, when the county of Indiana was one of the best counties in the State in the colts got there; they were brought over into Huntingdon county and some of the finest horses raised, and our

fathers sold them at good round prices. Now that industry has all gone out of the country.

I would like to hear now from some of our friends, whether they think this is practical or not. Our good Governor, who is so much interested in farming, and all industries of this kind, perhaps might take the matter up if he could be convinced of its importance, and he might be inclined to amend his proclamation so as to cover this subject, as one of the specific matters of legislation to be acted upon at this special session.

MR. CHUBBUCK: Mr. Chairman, I just want to second Mr. Hutchison on that, and I believe it is perfectly feasible. We have now in my own county one of the Belgium draught horses, a very fine animal weighing some sixteen or eighteen hundred; one of the handsomest animals I ever saw. An organization of farmers bought this horse as an experiment, and I think they are going to make it pay.

The CHAIRMAN: We have the pleasure of having Judge Beaver with us at this time, and I know that you would all be glad to hear from him.

ADDRESS OF GEN. JAMES A. BEAVER.

Mr. Chairman and Gentlemen: I have no theories on this subject, but I have a little practice. I believe rather in the man who practices than in the man who preaches. I went into the French coach-horse business once myself with nineteen of my neighbors. We paid \$2,100 to the gentleman who brought a single French coach-horse into the county. We got five per cent. off for cash. My share cost me \$95, and I am satisfied that \$1,500 if not \$1,600 went to the man who sold it to us. We stood him, and I think I had two colts out of him. We were to have a colt a year. I got two colts; we kept him at our farm without any charge, and in about three years they began to call on us for a contribution for his keep during the winter, and about two years later he died. I am afraid your experience might be similar. Now that horse had a good groom, was carefully cared for, was looked after every place he went by some one that was interested in it, and if you turn my friend Hutchison's horses over to the County Commissioners, I think they would die inside of a year, and the State of Pennsylvania would get about ten cents' worth of horse-flesh for all that she paid, and not a cent more, because we had practical horsemen looking after our purchase, and I am satisfied that we didn't get more than about ten cents' worth of horse-flesh as the result of our investment.

I do not believe there is any industry in the world that pays such a percentage as the man pays who indulges in it—in the purchase of fine breeding stallions, as they are called, that are brought into this country and sold at high prices and they are never worth what you pay for them, and unless you could get the State to engage in the purchase of horses where they are bred, and get into relations in some way or other, with the countries that breed them, I do not think it would be a success. If we go into the open market to buy in France or Normandy, or Belgium, where our French coaches and Belgian horses are bred, I do not think we could make a success

of it. If we could get into relations with our Government, and get France to loan us or sell us some of their own horses, there might be something in it, but to have the horses pass through the hands of a sales agent in Belgium or Normandy and then through the hands of another agent here, you know what that means. There is, of course, force in the idea of the Government looking after breeding, not only for horses, but for cattle and for sheep.

I called day before yesterday with the Assistant Secretary of Agriculture, at State College, and we looked down from the dome of it over our great Nittany Valley and became enthusiastic over it, and I said, I do not see why you cannot organize a project here in your Nittany Valley that would give us a distinctive breed in this community, and would do more for the dairy interests of Pennsylvania by getting the Government, which the Government would do, to put a certain number of bulls into this valley, so that you might breed for milk and for beef, and at the same time you would do more for the dairy interests of Pennsylvania than in any other way.

I think that the demonstration that has been made in the breeding of plants, has done more for the instruction of the farming interests of this country than any other sort of education that we have had. Now this thing of breeding plants and improvement by breeding, is comparatively a new thing for us, but it has an educating influence that extends not only to plants but to animals.

I confess that it was rather new to me that the Government would lend its aid to the development of new breeds of cattle, just as it lends its aid to the breeding of new plants, and improving the varieties of plants which we are growing on our farms. I do not know whether you have had any papers on this breeding of plants, but if you have followed the thoughts involved in it, and the progress that has been made, you have found what Iowa has done in the matter of her corn raising by calling into its service the railroads. Take the great railroad of "Jim" Hill and see what it has done. He has not only given us a railroad, but has invested money in live stock and in plant culture, and has sent out men who have inculcated plant breeding, sent them out broadcast over the country.

I think that if some such plan as that was adopted in Pennsylvania, illustrating the breeding of corn, if the railroads would take hold of it and send it over their lines, the Pennsylvania and the Lehigh Valley and the Reading; if they would combine, they could reach nearly every part of Pennsylvania, and following the course pursued in Iowa by the railroads there, they would add twenty-five per cent. in five years to the value of our corn crop, because we would grow more and better corn, and grow more of it to the acre, and as a result it would bring more profit, instead of a barely living profit on the best corn that we can raise.

That is what they have done in Iowa, and the thought there grew in the mind of an old Pennsylvania Dutchman, who moved out there twenty-two years ago and bought 28,000 acres of land, and they have got it in that family yet, and the boys who have been educated in Harvard and Yale, have come back to follow their father's occupation. They had ideas as well as crops and one of those boys has taken up this great question and from his study of it has grown the great plan which has been adopted by their railroads and by their agricultural college for reaching and teaching the farmers all

over the State by means of a car that runs specially for the purpose, a car that goes to each one of the agricultural sections for the purpose of instructing the farmers of the State by adopting this plan of breeding for improving corn and for the increase of corn production.

Now this question of breeding, of course, has taken me off of the subject, but there is more in Hutchison's idea, perhaps, than we at first think. If the Government can import bulls and transfer them from one part of our country to another part of the country, if they can import cattle, it is just as practicable to do it in the matter of horse breeding, and if the United States Government would get into relations with the French Government and Belgian Government, so as to get from the Government breeding stations the best kind of horses from those governments, I cannot see why if the Government were to establish a stand in any one of our counties and put a competent man in charge of a stallion, why we might not reap the results of it just as we are reaping the results of breeding plants under the auspices of the Agricultural Department at Washington.

The Government is doing more for the South in that direction than for the North, because the South has had no variety in their agriculture, and they are establishing farms all over the South in order to teach the people that they can diversify their agriculture, that they can feed their own stock and own animals as well as raise cotton and "hog and hominy" and at the same time improve their lands.

There is one man at Washington who is giving his whole time to running these farms in the different parts of the South in order to demonstrate that if that can be done in one direction, there is no reason why it cannot be done in another.

In speaking of turning this over to the Commissioners and having a special place provided for keeping them well, it seems to me there is no reason why we could not improve our horses ourselves as well as improve our cattle. I tell you, gentlemen, that we have not yet started on the development of our agriculture in Pennsylvania; we have scarcely made a beginning and it is just now that we are waking up to the tremendous consequences, to the tremendous influences, to the tremendous results that follow from a study of agriculture, and the practice of the best agriculture that there is in the country.

My friend who has read about the time that we shall leave the farm, wants to go a step farther. He wants to make it not only the most independent occupation in the world, but the most absorbing occupation in the world. There is not any occupation that has so much science at the bottom of it and so much in the way of practical results at the top of it as the avocation of scientific agriculture, the ordinary everyday growing of our crops and our animals. It is just such talk as this and just such talk as Hutchison has put out, that will enable us to reach practical results, that will make Pennsylvania what she is and ought to be, the leading State in agriculture in all its varieties of production.

Why, the dairy products of the United States are third in value, possibly second to corn, and even the industry of hens is fifth in the value of the products in the United States. If you look at the population of Pennsylvania and the distribution of the population, you

will find that we have more small cities of 20,000 and over, than any other State, and what does that mean? That means that the dairymen and the poultrymen are wanted in every one of those centers of population, that there the door of opportunity is wide open for the right man to enter in.

Now what does all this mean? It means that we must bring our best thought to our dairy and poultry departments of agriculture because these centers of population are ready to absorb the best that we have and the most that we can raise. I suppose that most of you have had my experience. When Mrs. Beaver and I were over in New York, about Thanksgiving time, the old lady that furnishes our turkeys says, "You usually get your turkeys from me, and I want to tell you that I had a man here to-day that offered me twenty-two cents a pound." Now we used to buy them at ten cents a pound. Mrs. Beaver, being afraid that she might not get any turkeys, immediately said to the old lady, "Why, certainly." Before Christmas came they were down to fifteen cents, and the old lady got her twenty-two, and she had it honestly because the hucksters had offered her that.

I want to tell you that all these questions of breeding clear through to the poultry yard, and of getting the best results from them all, are they not worthy of discussion, and worthy of thought and worthy of theory in every direction, therefore it seems to me that we will do well if we begin at the very foundation of breeding. We know what it means in the horse, we know what it means in cattle, we know what it means in poultry, and we know what it means in plants, therefore, the great importance of getting at the bottom of the thought involved in breeding for all products of the farm.

I hadn't thought of saying anything and would not have said anything if friend Hutchison had not called on me, but it is a great pleasure to get a new thought and try to analyze it and revolve it in your mind, especially when you can see that it may lead to important practical results.

Prof. Hamilton was called upon by the Chairman, and upon request, came forward, speaking as follows:

ADDRESS OF PROF. JOHN HAMILTON.

When Mr. Fenstermaker was making his speech, he referred to an organization in the State that he said was deemed on all hands to be ornamental, and he hoped it would be useful. I suppose he referred to the new constabulary force that has been recently organized in the State of Pennsylvania. In thinking over the suggestion and applying it to the State Board, I am sure that the State Board is deemed on all hands to be useful, and as I have been sitting here looking at the backs of your heads, it is decidedly ornamental. The usefulness of this Board I think has been limited, heretofore, far below its possibilities. The Board is the representative of the agricultural societies of the State, and the agricultural societies represent the progressive young men of Pennsylvania. That much of their work has been in the wrong direction, is admitted I think on all hands. All that they need is that their energies shall be directed in the right channels in order to have wonderful results. It seems to me we ought to utilize these young men who are engaged in con-

ducting agricultural exhibitions throughout the State; we should utilize to best advantage these organizations that give life and being to this State Board of Agriculture.

Those of you who read the last recommendation I, as Secretary of Agriculture, made to the Governor of this State, will perhaps recall that I referred to this matter that has been brought to our attention by Mr. Hutchison. I asked the Legislature to make an appropriation of \$25,000 to the Secretary of Agriculture for the purpose of improving our county agricultural organizations. The plan proposed was practicable. It was to offer a premium to such agricultural societies in the State as would put up exhibits of valuable articles worthy of the attention of agricultural people. It was proposed to offer a premium to agricultural societies in the State that would organize and equip a stock barn and put in breeding animals that would be selected by veterinarians appointed by the State, and have these animals for service in every county, guaranteeing associations that had good animals thus approved and had them accessible to the membership of the organization first, and then afterwards to other citizens through the county, that the State would give them a bonus of anywhere from three hundred to five hundred or eight hundred dollars to encourage them in breeding animals that would be of value in the improvement of the live stock of our State. This was to include cattle, horses, sheep and poultry. The agricultural societies would thus be live organizations for 365 days in the year, and of service to the people. We could by this means revolutionize the stock industry in twenty-five years, yes, in ten years. Twenty-five thousand dollars is not enough. I believe that that is the cheapest and the most effective way of bringing about a change in our stock industry, one that can be put in operation immediately, and I am satisfied one that would be accepted by nine-tenths of the agricultural societies of our State. I believe now, as I did then, that the State could appropriate money to no better purpose for the development of the animal industry of our Commonwealth, than to put it into the hands of these young men who are running our agricultural organizations in the several counties, given to them through the Secretary of Agriculture, so that they would not be paid anything unless the animals that they had for service were approved by proper authorities. I believe that we can neither improve our stock in this State nor in any other state until we do what foreign governments have done. In Hungary there are the largest stock barns in the world. Their animals for breeding horses, cattle, sheep, swine and poultry are under government control. The military, the standing army, have charge of these stock farms and the soldiers are sent out in the spring of each year with the government stallions to various parts of the country, and these animals are kept under government supervision, and in the custody of the soldiery of the country in these several districts. In that way the Hungarian Government has bred the best horses perhaps that can be found anywhere on the Continent of Europe.

We cannot do precisely that, but we can approach it. I believe that we ought to help people to help themselves, and so by giving this help, by giving this expert advice in order that these animals

may be properly selected, the State will be doing along that line all that it ought to do.

I believe that this Board has only begun to occupy its field of usefulness. It now has an appropriation of its own, and people will look to see the work of the Board enlarged and will be disappointed if the State Board of Pennsylvania shall not be quoted all over the United States as an example of progress in the aid of agriculture in this great Commonwealth. No other State society has the opportunity that this State Board of Agriculture has, right here in Pennsylvania, and you can get all the money that you need if you only will ask for it. The Legislature is ready to help you if you show yourselves useful. I know the men who belong to this Board and I know they are in earnest. I know that they will properly spend any funds that the State may give into their keeping. I believe we ought to utilize these county organizations that we have, keep them from being mere fake concerns, and turn them into beneficial organizations, so that they will be highly useful to the State instead of being referred to with a sneer.

Are you ready for this great work? Some of you are getting old, some may be getting a little tired. If you are not ready, my advice is to get out and let some young man come in. Let us have progress. Do not let us stand still, but let us go on from one advancement to another.

Thirty years since, you and I, Mr. Edge, met here with a few others to organize the State Board of Agriculture. I believe we are the only two living members who were present at the birthday of this organization. The next thirty years ought to make great changes in Pennsylvania agriculture, as the past thirty has in the theories of this Board.

Another thing I want to say while I am on my feet. There cannot be anything done in agricultural advancement except through education. You need to stand by your State College. I tell you in every state the agricultural college is the rallying point of agriculture, and the more I go over our great country, Iowa, Wisconsin, Michigan, Minnesota, Illinois, the more I realize this fact, that we must look to the State College for our inspiration and instruction. I have just come from Nebraska, where five hundred school children from all over the state had come up to their State Capital to a great corn exhibit, of articles made from corn, cooked by school children fit for the finest epicure in New York city. They are awake out there. Now, what can we do in Pennsylvania to wake up our agricultural people? If we take this matter of the improvement of our live stock in hand with our great State treasury full of money waiting to be properly expended, what may we not accomplish? We have all the advantages that any men could desire.

Dr. Schaeffer was called and spoke as follows:

DR. SCHAEFFER: Mr. Chairman, the only thing that the people of Pennsylvania have allowed me to think about in the last three months is vaccination, and when farmer Hutchison brings over those stallions from foreign countries, the first thing we will do will be to have them vaccinated. I hope we will have a law passed so that we will be obliged to vaccinate our trees against San José Scale, and

then go one step further, and when the soil becomes unproductive, I would like to have the farmers send down to Washington and get some of that stuff by which they vaccinate the soil, so as to make that more productive. I presume that if all these reforms are carried into effect, that these farmers who farm the farmers will begin to farm their own farms, and there will be a scratching on the farms, far more vigorous than the scratching of those hens in the Buck-eye state.

Prof. Shaw, of Minnesota, was called upon and spoke as follows:

ADDRESS OF PROF. THOMAS SHAW.

Mr. Chairman and Gentlemen of the State Board of Agriculture: I must say, gentlemen, that I listened with a good deal of interest, particularly to the report that was made on the live stock industry, and I fancy I do not require to tell you as a piece of information, that that is beyond all comparison, the most important agricultural industry in the United States. I take it for granted that you know that the relations between the prosperity of the live stock industry in the State and the value of the land, and the profits that are made from the land, are of the very closest kind. I take it for granted that you know—I simply speak of it by way of reminder—that the State that leads in the United States in the production of live stock, is the State of Iowa, is the same State that leads in the profits that are obtained from the land per acre, and as it is everywhere in the different states of the Union, that the relation between the value of the live stock kept in the state and the profit made by the people of that state from agriculture—that the relation between them is simply inseparable. I take it for granted that you have noticed that in communities where live stock flourishes most, that there the land is still best, that there the fertility of the land is best maintained. I take it for granted, Mr. Chairman, that you know that the relation between the value of the land and the amount of the live stock kept on the land, is of the closest character, so close that the two are practically inseparable. In the southern part of the State of Minnesota farm lands have sold for \$100 per acre, while in the Red River Valley, where the land is equally good, where they have good lands but where wheat growing only has been carried on and the growing of live stock has been neglected, there you will find that land sells for only \$20 to \$30 per acre, and the only solution of that which I can give which explains the difference in the value of the land in the Red River Valley and the southern part of the State of Minnesota to which I have referred, is that in the one case they grow grain, and in the other case the farms are well stocked. I take it for granted that the State of Pennsylvania gives its attention to that matter which it is important to observe.

I was surprised at the report given in regard to the sheep industry. Why, it seems to me, gentlemen, that from what I saw yesterday, that I never passed over a state that was better adapted to the growing of sheep than on these hills of this same State of Pennsylvania; and I must say, sir, that I was somewhat pained to know that there are fewer sheep in the State of Pennsylvania now than there had been some time previously. I was surprised to know that the dogs in the State of Pennsylvania had more power than the farm-

ers or the Legislature of Pennsylvania. I acknowledge that while I am an American, and intensely so, that I have not been long in these United States to get right down to the bottom of the politics of the country, so that I will not attempt to give an impression along that line, which might be erroneous.

I would like to make this suggestion, Mr. Chairman; I think if there is any one thing in the world that is more valuable to a man than any other thing, it is the way that he makes a proper use of time and opportunity. I do think that a man is untrue to himself and to the man he talks to, when he is given an opportunity to talk about a question when he does not try to make some suggestion of a practical character that can be put to a proper use, and before sitting down I would like to leave this thought with you. I would like to know why the winter lamb industry does not tower way up higher than any other industry in any other state in the Union in this State of Pennsylvania. I know that dogs may interfere with this industry to some extent, as the sheep industry is ordinarily carried on.

You know that a winter lamb is grown in the winter. It is fed rapidly. It is pushed along until it reaches the age of about two months or two months and a half, and attains the weight of about thirty to forty-five pounds, and then it is sent to market, and commands a high price. Now, it seems to me that the markets that you have in this State—you have markets everywhere—markets right at the door, and it seems to me markets among the very best that can be found anywhere, and it seems to me that the demand for that kind of a product would be almost unlimited.

I worked out that problem myself in the State of Minnesota. What I wanted to do was to find out how the farmers could begin cheaply and get that habit established with common ewes. I worked out the problem and it worked out very satisfactorily. We began with ewes that could be bought for three or four dollars apiece. We saved the progeny and improved it, and we had not to go three generations until we found that the proper habit of dropping the lambs in the fall had been, as it were, completely established, and the only other considerable expense was the outlay that was involved in the purchase of the necessary rams. I do not know what those lambs would sell for in the State of Pennsylvania, but I know that that kind of lambs has been reared in Minnesota and sent to New York and sold for ten dollars apiece. You may say why didn't the people of Minneapolis pay ten dollars rather than send them to New York? It was simply for this reason. The people of Minneapolis had not got schooled to their use. I did succeed in selling them in St. Paul and Minneapolis for seven dollars apiece; we never got quite to the ten dollar mark. We got that for lambs that weighed forty or forty-five pounds apiece. Now, when a man can get that amount of money for a lamb so readily raised and at so comparatively small expense, and the profit so quickly realized, he is engaged in a business that is going to keep him on the farm.

Mr. Cook, of New York, was called for, and came forward and spoke as follows:

ADDRESS OF H. E. COOK.

Mr. Chairman and Members of the State Board of Agriculture: I am sure it would be impossible for me to follow the eloquent gentle-

men who have preceded me without feeling somewhat embarrassed, and my reputation will be better sustained by keeping quiet. I have to speak to you people to-morrow, not only once but twice, and at this late hour it seems to me it would hardly be in keeping to take your time.

I have been deeply interested in what you have been saying; I like to hear men talk about their great possibilities, because I suppose not one of us will ever live up to his possibilities. I do not think much of a man that does live up to his ideals. When you get to that point, it is about time to drop off and pass into the other world. I like to have the ideal just a little ahead. I believe you are the second greatest state in the Union, sir. I believe in standing by your own State first, last and all the time, if you do have to lie a little to do it. I believe in your standing by your opportunities, great as they are. I believe that the time is ripe for eastern investment. I believe, farmers, that the time has gone by when men should seek western investments in lands. We hear a great deal about the psychological moment. It seems to me to-day, as far as eastern lands are concerned, it is a farmological moment, if I may be permitted to use that word, and that the time is ripe for the East to do something. I have seen something of Eastern agriculture and something of Western agriculture. I have been over a large portion of the East this past year, and assure you that men, not alone in the State of Pennsylvania, are bestirring themselves and are waking up to their opportunities. Why, in the old State of Maine, even in that old state, the farmers think that is the best place that God ever permitted his sun to shine upon. Wherever you go there, you will find that the people think that it is the only state in the Union, and you will find that they have bred there a true type of Americanism and you will think after all there are good people in Maine, and those people are stirring up things in the line of their best interests while the western man takes very little stock in what we can do. He usually tells us, "O yes, New York, Pennsylvania and New England are mighty good places to be born in," and then drops the whole proposition right there. We are now coming to the point where we are going to show these people what we can do.

I saw some farms last week, going over the old State road of New York, that in my judgment afford a better place to put money than even the great State of Iowa.

I was glad to hear another suggestion here as to the necessity of rallying around the agricultural college closer than you ever did before. I spent yesterday with a gentleman near Owego, in our State, a man doing splendid work on his farm taking those old hills and utilizing them, getting five cents a quart for his milk. What do you suppose he says? He says, Cornell University is responsible for this whole thing. He says it is responsible for this work that I am doing here, and he is a modest fellow, too. He says Cornell University is responsible for this and more. That man is fit to teach, and yet he told me that his business would be so ordered and adjusted that he should go, to Cornell University, each winter and spend a little time there checking himself up to date. When you come in contact with such men and realize their influence, you better appreciate the work of the agricultural college. I tell you it means much. I do not know just how much support you are giving to your schools

here, but I tell you farmers that the agriculture of the future, yea, and of the minute, must rally around its agricultural college. Let us stand by that. I have seen too many men who have not appreciated what is being done for the interests of agriculture, but I trust the time is now here when there may be a better understanding, and when our farmers will be convinced that that is what they want to do.

The CHAIRMAN: I have been very highly interested in what has been said, but as we have here very high legal talent with us this evening, I would like to hear something on this road question and the road laws.

MR. McCracken: Mr. Chairman, I was going to say that we all have our hobbies, as they have been suggested to me, by listening to the several papers that have been read and the suggestions that have been offered; but to my mind, the one thing that has made the deepest impression upon my "thinking pot" was brought out by the discussion of the road question. As the Chairman has just suggested, if there ever was a people on God's earth anywhere that for generation after generation was cursed with a curse that knew no blessing, it was the people of Pennsylvania under the road system we have lived under. It has been already suggested that after our forefathers and ourselves have been living under this curse for so long, the time has finally come when it seems as though we were about to launch upon a new era.

I believe, Mr. Chairman, that now for the first time in the history of Pennsylvania, we have the beginning of a system that is going to make the Commonwealth a system of roads of which we may well feel proud; but let us remember this fact, that in the building of public roads, as in the building of anything else, there are certain fundamental principles that we must get down to, and which, if we adhere strictly to, we will be led to success, but if we deviate from them, we will be led to ruin. It is just the same in road building as in anything else.

Now what are some of these fundamental principles that first suggest themselves? Before we can realize what the benefit of the new law will be, we must fully realize what the details of that law are. Now what has been the trouble with our old road system? It is this. It was built—the roads were required to be built altogether by the class of people who ought not to have built them at all. The burden of building roads has been placed altogether on the farmers of Pennsylvania, the men who use them the least, but I am glad that under our new system on which we are entering, that another principle is being recognized; that under our present law, that the State stands ready, out of this big treasury that we have been talking about, to contribute at least fifteen per cent. toward the building of our roads. Now that is a step, my friends, in the right direction. It is a step that is going in a very few years to enable the people of the State of Pennsylvania to enjoy a system of good public highways, and when that fifteen per cent. of the system has been in operation a year or two in Pennsylvania, the people of Pennsylvania will realize that it ought to be forty per cent., and they will so make it, and in that way, when the public roads come to be built and maintained by the public who use them, then we will have a pub-

lie road system that will be a credit to Pennsylvania. You show me a community where they have finely rounded up, good public roads, and I will show you a community where they have lovely homes, happy homes and a prosperous people, but you show me a community where the water runs down the center of the road, besides, grown up with bushes, and I will show you a community where the people do not amount to the snap of your finger.

The CHAIRMAN: I would like very much to hear from some of the gentlemen who could give us in a very few words just what our road law is that we are trying to get in practice.

MR. HUTCHISON: Mr. Chairman, we have here the chief clerk of the Highway Department, Mr. Roy D. Beman, and I have no doubt but that he would give us that explanation; will you come forward and say a word, Brother Beman?

The CHAIRMAN: We would be very glad to have the chief clerk of the Highway Department come forward and give us in a few words the substance of what the new law is.

MR. BEMAN: Mr. Chairman, I was deputized by Mr. Hunter, absence on his part being unavoidable, to come here for the purpose of giving you a very few figures and answering any questions that might be asked relative to our work. The two things, agriculture and good roads, go so closely together that it seems fitting that our Department should be represented.

I want to refer, in the first place, to Mr. Fenstermaker's very able report and to one of his remarks in which he said that it was stated or claimed by the Department, that there was less opposition to the State aid measure, or the Sproul and Roberts law, as it is known, than at first. That is true, and more than true, and that it has decreased to a great extent, I think can probably be best proved by the presentation of some figures. We have received up to, and including to-day, 574 applications asking for State aid in building roads. Those applications cover 1,101 miles of road. They come from 61 of the 66 counties of the State with which we have anything to do; as you can readily see, these applications, coming as they do from 61 counties, it is a mere matter of mathematics to ascertain that 92 per cent. of the entire State is represented among these applications. The applications come from 328 townships out of 1,548 in the State, or in other words, about 21 per cent. of the townships have applied for State aid, and 37 boroughs under the amended act, passed by the last session of the Legislature, have also applied for State aid, a provision of the law being that only sections of roads in boroughs which form parts of and go with adjoining sections of roads in a township, can be rebuilt through State aid. Furthermore, in 37 counties out of the 66 in the State, we have now on file as many or more applications for roads as can be constructed by the State aid apportioned to those counties up to the first of May next. I think that these figures will answer conclusively the question whether or not the people are waking up on this subject.

I referred a moment ago to a provision of the law touching upon roads in boroughs, and I want to say that it is the policy of the Department, so far as it has any influence upon applications, to

have applications, or as long stretches of road as possible, in order to get up a pretty continuous line of road. It is true, however, that in many localities, people who are not familiar with the road question, who do not know what a good road means, are not willing to go in it deeply enough to build more than the minimum length of road allowed by the law. In such cases, it seems to me that it is wise to build those little short pieces of road. The wisdom of that has been shown wherever a short piece of road has been built, because it has stimulated the people to build more.

I do not know that I can add anything further, excepting to correct a misapprehension which may exist in the minds of some, as to the laws most recently enacted respecting road taxes. The State aid measure, the one under which roads are rebuilt under the direction of the State Highway Department, is the Sproul-Roberts Road Law, originally passed in 1903, re-enacted, with some changes and amendments, in 1905. The new law which controls the election of supervisors is not the Sproul-Roberts law. I make this statement because the newspapers of the State quite widely heralded the fact that Judge Bouton, of McKean county had declared the Sproul-Roberts law to be unconstitutional.

I think, Mr. Chairman, that covers all I have to say, but I should be glad to answer any question asked me.

A Member: Mr. Chairman, I would like to ask a question in regard to this road law. It appears that a law has been recently passed that we are going to vote on this coming month; that is the one that the gentleman has referred to. Now we have a law that is known in the western part of the State as the Flinn Law and we have in our county and adjoining counties three road laws in operation. Now can we work under all three of those laws?

MR. BEMAN: As to that, I will say that I think there is no question but that you can work under all three of those laws, because, as a matter of fact, when they are properly looked at, they are complementary, the one to the other. State aid makes it possible for roads to be constructed at less expense to local taxpayers, the county paying one-eighth of the cost. Beyond a certain point, reconstruction by State aid cannot be carried out, because of the law's restrictions, therefore, when applications from a given county have been filed sufficient to consume the entire apportionment of any one year, a halt is reached in the construction of roads by State aid. If that county has funds at its hand, there is nothing to prevent it from going ahead with the work.

MR. TAYLOR: In Washington county they are putting up some of that road in Mt. Pleasant township. We have different pieces under the Flinn act going on at the same time. Now the point is this: Mt. Pleasant township is paying a share of that under the Sproul act. Now if the county puts up a part of the road under the Flinn act, they must pay their proportionate share of that located in another part of the county, and then under this recent act which we are going to vote on, they put the money directly in their own road. Now the question is with our people, is it right that we should pay so much in road taxes in that way?

MR. BEMAN: That is not a question for the State Highway Department, but a question for the people of Pennsylvania.

MR. BLYHOLDER: There is one question I would like to ask, and that is, under the recent law that we are under now, supposing they can, in certain townships, get men to serve without compensation, what would be the action then? Or supposing a township should elect their men and they should refuse to serve, what recourse has that township then?

MR. BEMAN: I would say in reply, that that is a question that I have never been able to answer satisfactorily to myself.

MR. FENSTERMAKER: I think that the Court appoints in that case.

MR. BEMAN: It does not seem to me that there are many communities where there are no public spirited citizens who are willing to try for a year at least the experiment of this new law; there are a number of things, of course, that are not perfect, but it seems to me that at least a year's trial would be fair and proper.

As to the question of compensation, the Deputy Attorney General held that the Supervisors could not receive any compensation for the time spent by them in performing their duty, but that they could be reimbursed for their actual expenses.

A Member: What is the actual minimum amount of miles that a road master can take.

MR. BEMAN: The minimum amount is five miles.

A Member: What is the maximum?

MR. BEMAN: The entire county, if the supervisors see fit to do so, but it must not be less than five miles.

A Member: Why is it that the farmers are left in ignorance in regard to the road law?

MR. BEMAN: The State Highway Department issued several months ago a copy of both of these new laws and placed in the hands of every newspaper in the State, a full and careful abstract of all the new provisions of the law, with the request that each of these papers should publish it, or as much of it as they were willing to do. Further than that we are not able to do; we are not able to ship copies of the law to every person in the State, but we do send them to every person who asks for them.

A Member: I would like to inquire as to the Secretary of the Board of Supervisors; he has a good deal to do, and has to do that all for nothing.

MR. BEMAN: No, the Secretary of the Board has the right to receive compensation for the work that he does as Secretary.

A Member: How much can he charge for it?

MR. BEMAN: That is for the Board of Supervisors to provide. I might say ~~one~~ thing further in regard to the new law relating to supervisors. There seems to have been an intention on the part of the framers of that law, to place that feature on practically the same basis as that of school directors. The school directors serve without pay. The supervisors are not required to spend their own time and personal service in the affairs of the road; that is placed specifically in the hands of the road master. The supervisors are the managing board and they appoint the road master to carry into effect their wishes. The new law removes a very large proportion of the amount of time that has formerly been consumed by supervisors in discharging their duties.

The CHAIRMAN: I would like to ask one question for information. Take for instance a town that wishes to build a road in connection with the township road, and running through a street, would they be allowed to pave that street with brick?

MR. BEMAN: We have in a few cases used brick. There are occasionally pieces of road over which the traffic is excessive, and where the expense of repairs would, in a short time, amount to so much that it is deemed wise to substitute brick for macadam, at a greater first cost, but a later less cost of repairs.

The CHAIRMAN: Another question. Are these supervisors allowed mileage?

MR. BEMAN: The opinion of the Attorney General holds that they are entitled to be allowed for actual expenses paid out for transportation and meals, and in case of necessity, horse feed, railroad fare, if necessary. I think a supervisor could make no charge for his own horse.

The question has been asked me whether or not a township can vote upon the question of a cash tax or returning to a working tax. I will state that the Attorney General has held that they can change back to a working tax if desired.

The CHAIRMAN: That is a part of the law that the Judge of McKean county has declared unconstitutional.

MR. BEMAN: Yes, his opinion touches no other portion of the law.

On motion, duly seconded, the meeting adjourned to 7.30 o'clock this evening.

Wednesday, 7.30 P. M., January 24, 1906.

At the designated hour the meeting was called to order, with Mr. A. J. Kahler, in the Chair.

The CHAIRMAN: The first paper in order, under the head of Microscopists and Hygienists, is by Prof. C. B. Cochran, of West Chester.

Prof. Cochran was absent.

The CHAIRMAN: The next paper is by Dr. George G. Groff, of Lewisburg, Pa. Is Dr. Groff present?

The SECRETARY: Mr. Chairman, Dr. Groff will not be here. The report can be read, or filed, just as you please.

MR. HUTCHISON: Mr. Chairman, I move that it be received and published in the proceedings.

Motion being seconded, it was agreed to.

The report of Dr. Groff is as follows:

THE FARMER AND PUBLIC HEALTH.

BY DR. GEORGE G. GROFF, *Microscopist and Hygienist.*

The farmer, from his location along and at the head of public water supplies, and from his being the producer of the largest portion of the national food supply, exerts a considerable influence upon the public health. It may be of value to refer to some of the more important points of contact.

I. WATER SUPPLIES.

These should be contaminated as little as possible. Animal waste of all kinds is of too much value to be thrown into streams, and besides, no one has any moral right to pollute and impair, for human use, a natural resource, given for the good of all. Buildings should not be drained into streams, and especially no privy, cesspool or sink should be allowed to empty into a stream. Privies should not be erected over streams. Farm sewers should not discharge into streams. The most harmful of all waste is that from human bodies and this we should keep out of streams. Night-soil should not be thrown into streams, nor should it be placed on fields near streams into which it may be carried by rains.

II. FOOD SUPPLIES.

Fortunately, most disease germs seem, with ordinary exposure to air and light, to be short-lived. Yet, it is possible for some food products to be contaminated on the farm, and to reach consumers in time to reproduce the disease. This is especially true of milk, a material which serves as a breeding ground for the germs of a number of contagious diseases, as typhoid fever, diphtheria and scarlet fever, and possibly for other germs. So certain are the above statements, that no person suffering from any disease recognized as contagious in any degree, should work among cows or handle the pro-

ducts of the dairy in preparing them for market. This restriction may often work hardship, but it is the only right and proper course to pursue. But probably the greatest harm results from many diseases occurring in so mild a form that their real character is not at all discovered, or not until the milk has been contaminated. This may be true of typhoid fever, small-pox, consumption (tuberculosis), measles, diphtheria, scarlet fever and dysentery. When any of these diseases are suspected, the affected person should have nothing to do with milking, working in the stables, or in handling the dairy products.

A consumptive, by spitting in the stable, might be the means of contaminating the milk, the cows lying down in the sputum, and so with the other diseases. A person who has been sick from any contagious disease is liable to convey it, so long as he has any discharge from the nose, mouth or bowels, due to the disease. Mere discharges sometimes continue a considerable time after the patients are apparently well.

Typhoid fever is the disease which has most frequently, of the above named diseases, been traced to contaminated milk. This may be due to the fact that the germ has a greater vitality and lives longer than the others, because it is more generally prevalent, and is more commonly unrecognized than the other named diseases. From dirty hands it passes to the milk in the act of milking, or in handling the milk or in washing the utensils. In a recent epidemic at Carbon-dale, Pa., a man with "walking typhoid fever" washed his hands in the tank in which the milk was cooled, and from this source, the germs appear to have gotten into the milk.

Another way in which milk is undoubtedly contaminated at times, is by cows standing in sewage-polluted streams. These polluted streams may be found near almost every town and village in the State, and as almost every community has at least a few cases of this disease every summer, and as excreta are generally disposed of in the readiest manner, this means of contamination becomes a highly probable one.

III. DISEASED ANIMAL PRODUCTS.

Fortunately for us, comparatively few diseases, which affect domestic animals, are transmitted to mankind. The cow and the sheep have tuberculosis is true, but the writer fully believes that it is extremely rare, that this disease is ever passed to a human, either through the milk or flesh of such animals. The possibility of such transmittal is not denied.

Cattle suffer from anthrax. The hides from animals dead of this disease are saved in some countries, and occasionally cause the disease to appear among tanners in this country, showing that the germ possesses great vitality. Probably no one in the United States would think of removing the hide of an animal dead of anthrax. Such animal carcasses should either be completely burned or buried six feet below the surface of the ground.

In some parts of the South and West cows suffer from what is called "milk sickness." The disease is unknown in Pennsylvania. Animals having this disease transmit it to mankind in milk, butter, cheese and flesh.

Milk and cheese (as also ice cream) sometimes undergo a decomposition which develops a deadly poison called tyrotoxin. Such products are so poisonous as to be totally unfit for human food. All decayed or tainted animal products are unfit for human food and are sometimes dangerously poisonous. Pigs sometimes suffer from a minute worm called the *Trichina*. Salting and smoking the meat does not kill the worm, which is invisible to the naked eye, and which, when introduced into the human body, causes a fatal disease, somewhat resembling inflammatory rheumatism. There is no way of distinguishing animals affected in this manner when alive and the only sure way of avoiding it is to eat all forms of pork, only after it is well cooked, never raw or partially cooked. Chickens suffer from Roup, a disease resembling diphtheria. All such birds should be killed and buried deeply.

When a contagious disease invades a farm house, the dogs and cats belonging thereto should be tied up until the disease has fully disappeared.

The CHAIRMAN: The next number on our program is the report of the Entomologists; first that of Prof. D. J. Waller, of Indiana, Pa. Is Prof. Waller present?

The SECRETARY: I received a letter from Prof. Waller and he declined the appointment and asked that somebody be appointed who is a specialist in that line.

The CHAIRMAN: Next upon the program is Prof. Franklin Menges, of York, Pa. Is Prof. Menges here?

The SECRETARY: Mr. Chairman, I have not seen Prof. Menges to-day although it was expected that he would be here.

The CHAIRMAN: The next number upon the program is the report of Prof. H. A. Surface, Ornithologist, of Harrisburg, Pa.

The SECRETARY: Mr. Chairman, Prof. Surface is not in this city at the present time.

PROF. MILLER: Mr. Chairman, I will state that I have Prof. Surface's report and it can be read or you can file it if you wish.

It was moved and seconded that Prof. Miller read Prof. Surface's report, which was agreed to, and it was accordingly read, and is as follows:

REPORT OF THE ORNITHOLOGIST.

BY H. A. SURFACE, *Harrisburg, Pa.*

Sometimes the Specialists on the Board wonder why they were appointed, what are their duties, what is expected of them, and what their reports should include. The Ornithologist finds himself in this condition of inquiry at present, especially as no member of this

Board has during the past year sent him any statements concerning birds or made any ornithological inquiries of him, as far as his records show. If the members of the Board be interested in Ornithology and desire a good report on this subject, they are respectfully urged to contribute records of their observations and to make such inquiries along this line as will indicate their interest and the trend of their thought.

We are able here to give a resumé of our ornithological observations in Pennsylvania during the preceding year, and hope that this may be accepted as a report by your Specialist, and as evidence of his continued interest.

One of the most remarkable achievements of the past year was the legislation enacted in what is now known as the new game bill, which placed blackbirds on the list of game birds, and permits gunners to shoot them from the first of September to the first of January, protecting them at all other seasons. We should also call attention to the list of unprotected birds. This is as follows: The Blue Jay, English Sparrow, Kingfisher, Cooper's Hawk, Duck Hawk, Sharp-shinned Hawk, Goshawk, Pigeon Hawk, Great Horned Owl and the Crow. These may be destroyed in any manner and at any time throughout the entire year, but all other birds are protected at all times, excepting game birds, during their respective seasons, and such other wild birds and mammals as are found in the act of destroying property. They can be killed while in the actual destruction of property, but at no other time. We find it necessary to emphasize the point that all other birds are as certainly and definitely protected by law at all times in this State as though they were known to be the most melodious song birds or the most valued insect-eaters, and it is not only against the law to shoot or trap them, but if they be native birds of this State it is illegal to keep them in cages, or to have in possession their eggs, or their tanned or cured skins or any parts thereof unless taken legally in this Commonwealth. Thus, it is illegal to shoot any kind of Owl, excepting the Great Horned Owl, and it is also illegal to shoot either species of Eagle, the Red-shouldered Hawk, the Red-tailed Hawk, the Pigeon Hawk, or any other species of supposedly obnoxious bird in this State, not named in the above list, unless it be found in the act of destroying property at the time it is shot.

During the past year we have noticed more than ever the tendency of people in the country to shoot Hawks and Owls and other birds and nail their bodies to farm buildings or fences. This is to be regretted, as it is resulting in the destruction of the chief enemies of field mice and voles, which are certainly increasing very rapidly. During the past winter thousands of trees were destroyed by mice, particularly the short-tailed meadow vole, and many reports reached us of mice destroying Indian corn and other grain in the field. Until the relentless warfare upon their winged enemies has ceased, we can hope for no modification of such reports.

The new law also makes the remarkable provision that no citizen can enter into the business of rearing the birds commonly known as Quail and Partridge, or Pheasants, without paying to the Game Commission a fee of five dollars (\$5.00), filing a bond of five hundred dollars (\$500.00), presenting certificate of character signed by at least two well known citizens, filing description of his premises, etc.

From few correspondents in the Eastern portion of this State we have received increasing complaints of attacks on fruits by Robins. These are due partly to the increase in the number of Robins, but more to the decrease of the native fruits upon which the Robins previously fed. This can be prevented by the following means:

I. Temporary.—(a) Placing stuffed birds in fruit trees at the season when the fruit is becoming ripe and Robins and other birds are liable to take it. Prof. Buckhout, the Botanist of this Board, reports to us a successful experiment in thus protecting his trees by placing in them a stuffed Owl and a stuffed Crow last spring. (b) Placing in the trees a cat in a large lattice box or cage. It is probable that this would be even better than the stuffed bird, and as a suitable box could be made of lath, the house cat could be used for this purpose and thus save both the fruit and the birds. (c) Shooting among the birds with blank cartridges. (d) Killing them while engaged in destroying fruit. (This is to be used only as a last resort.)

II. Permanent Means.—Plant such fruit-producing native plants, bushes and shrubs as the birds prefer. Among these may be wild cherries, blackberries, raspberries, and especially the service or shadberry, also known as June berry and Corinthian Cherry, and Mulberries. The Governor Wood Cherry and sweet varieties of strawberries may be permitted to become dead ripe and the birds will prefer these to others of more choice varieties.

There have been some reports of attacks upon English walnut by English sparrows, Robins, and Blackbirds. Mr. Gabriel Hiester, of Harrisburg, has had many bushels of English walnuts destroyed while yet young and soft on the trees by Blackbirds sticking their bills into them, and appearing to use their juice as an insecticide.

The English Sparrows have continued to commit depredations and even found new fields to conquer. They have been known to attack young English walnuts in Lancaster county; in several gardens they have stripped the vines of green peas; they have been seen to eat the buds from the twigs of pear trees in the early spring, and last June we saw them kill all four of the young birds in the nest of a Phoebe. They have rightly been charged with being the greatest agency in the spread of the San José Scale, while there are very few reports or observations in their favor. Among these are such as their feeding insects to their young and occasionally catching moths for themselves in the grass.

In some of the sparsely settled portions of the State, near forests, the Ruffed Grouse, commonly known as the Pheasant, has been known to inflict some injury upon apple trees by eating the buds during winter and early spring. It is well known that the winter food of these valued game birds consists chiefly of the buds of trees, particularly the catkins or undeveloped blossoms of the birch, alder and hazel.

The English Starling, which was introduced a few years ago, in the vicinity of New York, has found its way into our State and in Centre county we have seen and collected a few of these birds in the fall of the year. They are to be known by their close resemblance to the Blackbird, but slightly smaller and streaked with brown, and also by their peculiar short whistle and their habit of living singly or in pairs in open fields and flying into trees or bushes when ap-

proached. At present we do not regard the introduction of the Starling as beneficial to the interests of the farmers, as we believe that this bird has the possibility of proving to be a serious pest in grain fields without adequate returns for insects eaten. We hope this suspicion may not be fully confirmed, but time and careful study can only give us the correct answer.

During the past year your Ornithologist has delivered no less than ten illustrated lectures upon Birds, using colored slides, which were apparently appreciated by the audiences. He has also issued several publications upon the economic features of our birds, the last being his Monthly Bulletin for December, 1905, dealing with the Flycatchers. He regrets that it has been found necessary to reduce the amount and expense of public printing, and in so doing, the Quarterly Zoological Bulletins were curtailed. However, such ornithological facts as have been published in the Quarterly Bulletins of the Division of Zoology will be continued in the Quarterly issues of the Zoological Monthly Bulletin. Within a few months one number will contain a full discussion of the economic features of the Crow, Blackbirds and Jays. As we need help in the form of specimens to study in the preparation of this important publication, we here invite all members of this Board and their friends to send us such specimens of the Crows and Jays as they may be able to procure during each month of the year and also Blackbirds during the season when they can be legally shot. These may be sent by express to us at Harrisburg, at our expense, or by mail when postage will be refunded. Always attach the name of the sender and the date and locality when the specimen was killed. Since the fundamental object of these studies is the examination of the stomach contents, living birds are not desired. We also wish to request all interested persons to send such other species of birds as they may find dead or be able to collect legally without sacrificing valuable life for this particular purpose.

We wish to urge members of this Board to make all possible observations upon the habits of birds in their regions, respectively, particularly in regard to their economic features or their relation to mankind, and report the same to us in writing. If members from the different portions of the State would co-operate in making such observations and reports, it would not be difficult for your Ornithologist to prepare an annual report that would really be a valuable synopsis of the ornithological conditions, especially in regard to agriculture, within the State during the preceding year.

The CHAIRMAN: You have heard the reading of the report. What is the pleasure of the meeting?

It was moved and seconded that the report be placed on file.

Agreed to.

MR. HERR: Mr. Chairman, the Committee on Credentials have a supplementary report to make. We have received the credentials of H. H. Hall, of Potter county, and find them correct, and I move that he be admitted as a member for three years.

The CHAIRMAN: You have heard the Report of the Credential Committee. What action shall be taken?

It was moved and seconded that the report be adopted. Agreed to.

The CHAIRMAN: The next thing on our program is the Report of the Committee on Dairy and Dairy Products, R. J. Weld, of Sugar-grove, Chairman.

Mr. Weld presented his report which was as follows:

REPORT OF COMMITTEE ON DAIRY AND DAIRY PRODUCTS.

BY R. J. WELD, *Chairman.*

To my mind there is no more sure way of maintaining and increasing the fertility of our farms than through the medium of the dairy cow. She has the ability to convert the rough, coarse, bulky products into a concentrated, finished, marketable article which carries with it a very small amount of the productive elements of our farms, while the residue from the feeds contains, to a greater or less degree, all the elements of plant production, together with those mechanical properties so much needed in the soil of most Pennsylvania farms. In Northwestern Pennsylvania, where for years the lumber and oil interests have pushed the dairy into the background I am glad to say that with the clearing away of the vast hemlock and pine forests, it became necessary to look to some other source for revenues, hence the old Pennsylvania scrub-oak cow has been replaced or improved by the introduction of better stock, the improvement of the rations fed and the better care and housing, so that to-day instead of having cows that give milk for 7 or 8 months, we have all the year around dairies returning to their proprietors a profitable income and furnishing employment for the farm force from January to January.

Since the dawning of the twentieth century, much attention has been given to the better housing of the domestic animals on our farms, the new stables are made warmer, lighter and better ventilated than those built fifty years ago. Instead of the old leaky wooden floors, water-tight concrete floors are constructed at a cost less than the cost of one thickness of plank, to say nothing of sleepers and double planking. Improvement in the selection and feeding of the cows is noticeable in almost every community. Young enthusiastic farmers appreciate the importance of knowing just what their cows are doing for them, and are applying rigid weeding processes to thin out the unprofitable individuals, thus raising the standard of their dairies and adding to the profit from the remaining animals. On the whole, the past year has been one of encouragement to the dairyman. The growing season was a favorable one for both pasture and crop growth. The water supply was abundant and no periods of extreme heat were encountered. Prices of beef, veal and pork, all adjuncts of the dairy, have been good, and the demand has been brisk.

The chief drawbacks to the year's success have been the scarcity of good reliable farm help and the high prices of mill feeds. The help problem is becoming more serious each year. Many of our farmers

are selling their property at a sacrifice or are doing what they can themselves and allowing the balance to go undone. This condition of affairs is very much to be regretted as it has a demoralizing effect on all farm operations. Any suggestion which the State Board of Agriculture may have to offer will be welcomed by our dairy farmers, for, unless the dairyman can secure reliable men who are competent and careful milkers, he had better reduce his dairy to such proportions as he can himself care for. My only suggestion is, fewer animals but better producers.

There seems to be a disposition upon the part of some millers and feed merchants to put on the market mixed feeds with flowery names rather to the exclusion of straight, unmixed feeds whose prices are steadily climbing up, making their use almost prohibitory when viewed from a profit-returning standpoint. I hope that the Secretary of Agriculture will keep the dairymen advised as to the character and composition of these mixed feeds so that we will not be imposed upon.

DAIRY PRODUCTS.

The products of the dairy have been in good demand all through the year and the prices have averaged a little higher than in previous years.

One feature of the year was the very high market price of butter in the early part of March, followed by a very sudden slump of nine cents per pound, followed within thirty days by an advance back to nearly the high prices of March, there to remain until the Spring production came in to supply the demand, when as a natural consequence, the market gradually lowered. Be the cause of this fluctuation what it may, the effect on the producer is not for his good.

What is true of improved conditions for many dairy cows is also true in the handling and manufacture of her products. Better facilities for the manufacture of dairy products are being introduced on many farms. Dairy rooms or separate dairy buildings properly located are displacing the old methods of creaming the milk in the living room or one adjoining it. Young men from all quarters are going to our Dairy School, there to be instructed in all that appertains to the production and manufacture of first-class dairy products. These men return home to put into practical use the knowledge they have acquired, and become leaders in dairy work in their several communities, thus improving the output of that section. Each year we see an extension of the territory from which the large cities draw their milk supply. This relieves the farmers home of the labor of manufacturing, and lessens competition.

I wish to call attention to the demand for small, rich, home-made cheese. If one is so situated that he has the requisite time to give to the manufacture of such cheese, and has a milk testing 45 per cent. butter fat or better, he will find this branch of the dairy both interesting and profitable. The equipment is not expensive, but the time required in the process of manufacture is greater than that required for butter-making.

Some instances have come under my observation of the over-salting of butter. Only a few weeks ago, a sample of what appeared to be very good butter came to my notice, which was nearly ruined by

over-salting. In my own practice I have found it necessary to reduce the amount of salt used from one quarter to one half.

Either the dairy salt now on the market has a larger per cent. of saline matter or consumers tastes have changed in this respect.

In closing, permit me to recommend to our Legislative Committee the need of a systematic dairy inspection service similar to that inaugurated by some of the dairy companies in our large cities, which shall include all dairy farms, creameries and cheese factories, the object being to raise the standard of all dairy products. Make them first-class and we need have little fear of the bogus products getting our markets away from us.

We would also commend the active and efficient work of the Dairy and Food Division of the Department of Agriculture.

The CHAIRMAN: You have heard the reading of the report. What is your pleasure?

A Member: Mr. Chairman, I would like to ask Mr. Weld how much salt he would recommend per pound for proper butter-making?

MR. WELD: Mr. Chairman, I would say that that depends a good deal on the taste of the people you are supplying, but it depends also a great deal on the way it is worked. Most of the people in my section have advocated the butter-worker. In my own experience I use the butter-worker, but they are not so taught in the dairy school. Formerly I used one ounce of salt to a pound of butter, and I had complaints of over-salting and I cut it down to a half-ounce. As I say, I do not know whether it is in the salt or in the taste. In my own town there has been quite a good deal of complaint this summer about over-salting, so that I am inclined to think there is a difference in the brands of salts. I had to change brands of salt. I formerly used what was called a Genessee salt, and I had to change to the Ohio salt, and I now use half an ounce to the pound with the exception of two parties who like more.

MR. HUTCHISON: Mr. Chairman, I move that this report be accepted and spread on the minutes, and then it will be before the house.

Prof. Van Norman was called for.

The SECRETARY: I think you had better let the discussion go on and then take action.

MR. HERR: The motion is that this paper be received and placed on file.

The CHAIRMAN: Yes.

MR. HERR: Why not put the motion?

The CHAIRMAN: I think it is entirely in order for the gentleman to proceed.

PROF. VAN NORMAN: Mr. Chairman, as to flavor in butter, there is a marked change demanded in the market. This demand now looks toward a milder flavored butter, and along with that milder flavor has come a lessening demand for salt. The flavor of butter is the result of fermentation.

With the advent of the dairy business in our Western states, and the necessity of shipping long distances to our Eastern market, butter makers soon recognized that the milder flavor the market would accept, the longer the keeping quality of that butter, and those influences have worked together to give us a milder flavor and at all events now, it is a milder flavored butter that is mostly marketed.

A Member: Has the abstraction of cream had any effect?

PROF. VAN NORMAN: Yes, I think so in some sections. I went into one creamery not long ago where the butter was ruined from over-ripeness, and the manager said, as he drew in a full breath, "That is the way I like to have it, with that fine aroma," and that butter would be ruined in two days and would not be accepted in the Philadelphia or New York market. As to methods, some are using the combination churn and some the butter-worker. We have been using in our work for the three years past, the combination churn.

A Member: Mr. Chairman, there was one point raised by Mr. Weld that is of some little interest, and that is the question of the variation in the qualities of salt.

PROF. VAN NORMAN: I have had occasion to examine a great many analyses of various kinds of salt brought from Ohio and elsewhere. Probably the true salt flavor is of about of the same strength in each salt providing the degree of moisture is the same at the time of testing, but salt varies a good deal in the other constituents although they are present in very small quantities, for example the chlorides of lime and of magnesia. Those are the constituents that are undesirable, making the salt tend to become moist too easily, and producing a very pronounced bitter flavor, and that bitterness may be four times as great in one salt as in the other, but in the ordinary normal salt flavor, there is really very little variation.

The CHAIRMAN: It has been moved and seconded that the report be received and placed on file.

The question being put, it was agreed to.

The CHAIRMAN: Our next topic as it appears upon the program is "Breeding Live Stock on the Farm," by Prof. Thomas Shaw, Professor of Animal Husbandry, University of Minnesota, St. Paul, Minnesota.

PROF. SHAW: Mr. Chairman and Gentlemen: As has been announced, I am to talk to you on the subject of breeding animals on the farm. I would like to ask at the outset how many talks you have ever heard on this subject? I think I am safe, gentlemen, in saying that you have never listened to very many, and why? It is because of the difficulty connected with talking on a subject of this nature to make it interesting to practical men.

I think I ought to be frank with you and tell you at the outset that I am not going to tell you many things, probably not anything that you don't know now about the subject of breeding live stock. You may say, why do you come down all the way from St. Paul to Harrisburg to talk to us people if you can't tell us something that we don't know? I answer that by asking why did you go to church last

Sunday? I trust you were there. You didn't go to hear something that you didn't know, but you went to be put in remembrance of what you did know, and I came down here to try and stir up your minds by way of remembrance. I tell you, gentlemen, the great difficulty with our farmers, is not so much in knowing enough, as in remembering what they do know.

Prof. Shaw then gave the following address:

BREEDING LIVE STOCK ON THE FARM.

BY THOMAS SHAW, *Professor of Animal Husbandry, University of Minnesota, St. Paul, Minn.*

In some respects the rate of breeding is like a great deep hole in which an intellectual giant may sink a thousand fathoms and more at the very first plunge. In other respects it is a broad shallow, in which a child intellectually may wade without any difficulty. In some respects the operation of its laws is so regular and plastic that the skilled breeder may almost mould and fashion at will. In other respects they are so erratic and subtle as to confound the most skillful, the results are so different from what he expected. The great differences thus resulting in some instances from even skillful breeding are doubtless the outcome of laws that are apparently antagonistic, but not really so. They are apparently so because they are not yet sufficiently understood. It may be that they never will be, but, happily for the breeder, the results from the proper application of principles that are now well understood are so regular and uniform, that the man who diligently applies them, will, with unfailing certainty, so improve the average of the animals in his stud, herd or flock, that they will be brought to a higher level.

LAWS THAT GOVERN BREEDING..

The known laws that govern breeding are three in number. They are known respectively as the law, that like produces like, the law of variation and the law of atavism. The first and second of these laws are apparently antagonistic. The third, like a pendulum in the operations, swings between the two.

The law that like produces like means that the progeny shall be like the parents, not an exact fac-simile, for two parents are never found exactly alike, but in all essential features there will be a close resemblance. This resemblance will, with more or less of uniformity, extend to the physical form, to function, to habit, to disposition, and indeed to every feature of the organization. This law is the great magna charta of the breeder. The results from the operation of this law are by no means uniform. They will nearly be so, however, in proportion as the parents have been purely bred, in proportion as they have been bred in line without having reached the danger point of weakened stamina, and in proportion as the parents are strong and vigorous.

The law of variation, or the law that like does not always produce like, is apparently antagonistic to the law of variation. It means that

the progeny shall not always be like the parents, though apparently antagonistic to the first law, it may be simply a part of the same. The differences being the result of modifying factors in transmission as yet not well understood, and until understood, beyond the control of man. In breeding pure blood animals these differences are not usually very well marked, though they are constantly present. Sometimes they are very great, as when, for instance, the progeny of horned parents are hornless, but such variations are of infrequent occurrence. Some have claimed that in transmission variations are more constant and greater than resemblances, in other words, the second law of breeding operates more strongly than the first law. In breeding pure bred animals, this is not true. If it were so, the breeder would be on an uncertain sea, without sail or rudder. The only improvement that he could make would be through selection.

The presence of the law of variation is by no means inherently adverse to improvement in breeding. The result depends first, on the character of the variation, and second, on the disposition made of the animals which thus vary. Variations are sometimes downward, in other instances they are upward. When downward the animals should be eliminated. When upward they should be retained for breeding. Were it not for variations in the direction of improvement, advance in breeding would be impossible. Viewed from this standpoint the law of variation is a blessing rather than the thorn which it sometimes proves to be.

The law of atavism is the law which, in transmission, determines that the progeny shall be like some remote ancestor. It is probably a branch of the first law of breeding acting in a erratic way. Like the law of variation, it is a disturbing factor in breeding. But it is more disturbing than the former in that it introduces variations that are undesirable. It resurrects from out the dead past what the breeders have been trying to eliminate. The frequent occurrence of a white calf in the breeding of Shorthorns, which the breeders have been trying to avoid for generations, illustrates the disturbing character of this law. It may be that its existence is intended to compel the breeder to give careful attention to purity in blood lines, since its power wanes in proportion to the increase in the duration of the period covered by pure breeding.

Having thus briefly outlined these laws, the effort will be made to enlarge on some feature of their practical application to the operations of the breeder and also of every farmer who breeds even one animal on his farm. The points that will be more particularly dwelt upon are those which relate to the evidences of prepotency in sires, to the improvement of live stock through up-grading, and to the futility of promiscuous breeding in so far as it relates to the improvement of live stock.

PREPOTENCY IN THE SIRE.

Prepotency means the power possessed by a parent to transmit individual and breed properties to the progeny. The measure of its strength, however, is more evidenced in the former than the latter. Thus it is that prepotent sires produce uniformity in the stud, herd or flock. The uniformity thus produced is proportionate to the prepotency of the sire and the excellence of the uniformity is at least measurably proportionate to the excellence of the individuality in the

sire. The importance, therefore, of possessing good and prepotent sires, cannot easily be over-estimated. The truth that the sire is half the herd is only a half truth. He is as much more than half the herd as his prepotency exceeds that of each female parent in the same.

But how may it be known that a sire is prepotent before his prepotency has been actually proved, as evidenced in the offspring. The answer to this question is of all absorbing interest to the breeder, for sires are usually chosen before they have begotten progeny. This raises the question as to the probable guarantee of prepotency. These include purity of breeding, line breeding in degree and individual vigor.

Other things being equal, a sire is prepotent in proportion to the duration of the time that he has been bred pure. This result follows from the continuous increase in the dominant blood—elements with increase in duration in breeding without the introduction of alien blood. Whether there is a time limit to this increase is as yet an unsettled question. In other words, it is not yet certain that an animal from an ancestry bred pure for a thousand years will be appreciably more prepotent than an animal bred from an ancestry kept equally pure for five hundred years. These dominant blood elements having become thus fixed and stable, are transmitted with at least reasonable certainty to the progeny.

Other things being equal, a sire is usually prepotent in proportion as he is line bred or otherwise. Line bred means bred within the limits of one family for at least several generations. The closer the relationship at the outset of the line breeding and the longer the duration of such breeding the more prepotent the sire is likely to be. For instance, suppose a Shorthorn sire is chosen from the Missie family of Cruikshank Shorthorns. If the said sire is chosen amid progeny bred for generations from Missie sires and dams, no other Shorthorn blood meanwhile having been introduced, the line is likely to be more prepotent than if drawn from progeny whose ancestry included members of various families of Cruikshank Shorthorns.

Other things being equal, prepotency is strong in proportion as the sire is possessed of inherent vigor. This is in keeping with that other observed fact, that usually prepotency is stronger in an animal when at that age in which bodily vigor is greatest, rather than at an earlier or a later period in its life. The evidences of bodily vigor are form and action. The latter is usually spoken of as carriage, and as an evidence of prepotency, it is probably some more important than bodily form. The evidences of bodily vigor are such as relate to strength and vigor for the breed. The most prominent of these, probably, is not chest size so much as chest capacity. Vigor in action may be nicely illustrated by observing the carriage of a Southdown male. The vigorous male steps quickly. He carries his head proudly. His full eye observes everything. The slightest sound causes him to prick up his ears. Such a male purely bred is almost certain to be prepotent.

But what is meant by other things being equal? Simply this, that with each of the indications mentioned, the other indications shall be present in at least fair degree, and that the parents and progeny shall both be sustained with suitable food, fed in liberal, but not in excessive supply. For instance, long purity of breeding will count far more if linked with line breeding and bodily vigor, and so of each

of the other indications, and all these will be more potent when the feeding and management are favorable to high development.

In addition to the indications mentioned, the performance of the immediate ancestors for several generations should be carefully noted. By performances is meant what the animals have done in speed attainment, milk, meat or wool production, according to the end for which they are kept. Nor should the fact ever be lost sight of, that high performance in the ancestry is valuable as it is near, and less valuable as it is remote. High performance in the immediate parent of a sire is of great value, but high performance in an ancestor of ten generations in the upward line of ascent is of but little account. This will be readily apparent when it is remembered that the blood properties of an ancestor of ten generations previously, are only present in an infinitesimal degree.

The claim, therefore, that an animal traces to some famous ancestor of many generations back, is of but little account. It can only deceive those who do not know. Excellence in performance in the near ancestry is not only valuable, but it is valuable in proportion as it is uniform in the near ancestry and far reaching in its comprehensiveness. By uniformity is meant evenness of performance in all the near generations, and by comprehensiveness the extent to which various desired qualities are present.

IMPROVEMENT THROUGH UP-GRADING.

By up-grading is meant the improvement of common stocks through the use of successive sires chosen from one and the same pure breed. For instance, when common females, it may be of mixed breeding, are mated with a pure bred Holstein sire, and when the female progeny continue to be thus mated in succeeding generations, the product are termed grade Holsteins, and when this line of breeding is continued for several generations, they are termed high-grade Holsteins. When good and prepotent sires are chosen, it is in a sense wonderful how quickly common stocks will be improved, providing the food given is suitable and the care of the animals is proper.

When the process begins, mixed blood elements in the females is no detriment. It does not stand in the way of quick improvement. In fact the reverse may be true, since every additional blood element lessens prepotency in the female. In other words, the less purely bred she is, the less the power that she will have to transmit her own properties. Consequently, when mated with a purely bred prepotent sire, the preponderance of resemblance in the progeny is to the sire. The preponderance in all essential properties will come from him also, and in both instances, because of his superior prepotency.

Analyze further this up-grading process. Suppose the foundation female is a ewe secured from the range and that she is possessed of the blood elements of a dozen different breeds. She is mated with a prepotent Southdown male. Let the difference in blood elements or properties between the two at the outset be represented by 100. The first thought would be, that 50 per cent. of the properties or elements in the progeny would be inherited from the dam and the same from the sire. That is not true. More than 50 per cent. of those properties come from the sire, as many more as the prepotency of the sire in

virtue of his purity of breeding exceeds that of the dam. Less than 50 per cent. of those properties come from the dam, as many less as her prepotency or power to transmit her properties is less than that of the sire, as a result of her mixed breeding. The preponderance in properties in the progeny inherited from the sire will exceed those inherited from the dam, as much as the power of the sire to transmit his own properties because of his strong prepotency, exceeds that of the dam to transmit hers, because of her weak prepotency. This explains why, in the first instance of such mating, the progeny bear so strong a resemblance to the sire.

The difference in blood elements at the first, as previously stated, may be represented by 100. Now, since the progeny inherits far more largely in such breeding from the sire, the difference in those blood elements will have been reduced more than 50 per cent. So far as the sire is concerned, the progeny will be possessed of far more than 50 per cent. of inherited properties from him. The exact per cent. represented by such inheritance cannot be exactly stated, but it would be approximately correct to say that 75 per cent. of properties in the progeny were inherited from the sire, which would leave 25 per cent. of the same to be inherited from the dam. Thus a great stride has been made in the very first mating. The difference in blood elements now between the Southdown sire and progeny will be represented by 25 instead of 100 as at the first.

Mate with a Southdown male again and the progeny of the second generation will be possessed of approximately 90 per cent. of Southdown properties; of the third generation of approximately 97 per cent, and of the fourth generation of approximately 99 per cent. The progeny of the fifth generation will, in individuality and useful properties, be practically equal to pure bred Southdowns. This wonderful transformation may be accomplished in five generations of such breeding. In other words the entire common stock of farm animals in the United States could be transformed within the time named into pure breeds, that is into animals as good as pure breeds for practical uses. At the present time, however, the supply of pure bred sires would be far too little to accomplish such an end within the time.

Suppose that instead of pure Southdowns, grade Southdown sires had been used. If the prepotency of those sires in each instance exceeded that of the dams with which they were mated, then there would be improvement. The improvement would be proportionate to the excess of that prepotency. But even on the supposition that the prepotency of each Southdown male was superior, variable elements would probably appear in the progeny as the outcome of these elements in the sires, and these would in some instances at least make improvement slower, while such sires were used, the level of improvement reached would never equal that made in the former instance, and improvement would be made very much more slowly. The advantage, therefore, and profit from using only pure bred sires is clearly apparent when these can be secured without excessive cost.

Suppose, again, that the Southdown sires had been inferior individually, though purely bred, what would have happened? Why, because of their prepotency the result of the purity of their breeding, they would sustain their own individual superiority on the progeny. This might not have followed in some instances because of the influ-

ence of atavic transmission, resulting in bequeathing properties to the progeny possessed by superior ancestors. As a rule, however, the transmission would more or less resemble the inferiority possessed by the sire. The breeders of grades are usually content with a very common or inferior pure bred, because of the cheaper cost, but to invest in such is clearly a mistake. The place for all those inferior sires in the block in the case of meat-making animals, and in the dray or van in the case of horses. The breeder who chooses sires thus, makes a grievous mistake. An inferior sire is dear at any price. He is dear as a gift. The extent to which such sires have been used by the breeders of grades has greatly retarded live stock improvement.

The view so widely held that while the progeny of the first mating are a great improvement on the females from which they are bred, the progeny of the second mating, and also of succeeding generations, is likely to be inferior, is a fallacy. In up-grading such a result would be clearly impossible. The improvement will be continuous until the level of the breed is reached from which the sires are chosen. It is in cross breeding that such results sometimes follow, that is when sire and dam are mated, each strong in the blood elements of a different pure breed. In such instances, usually, but not always, the progeny is at least the equal of the sire or dam in useful properties, but not in prepotency. The improvement is probably the result of the renovating influence that would seem to inhere more or less in introduced alien blood. In succeeding generations, however, there may be a tendency to revert to one or the other of the two breeds thus mated, thus leading to uncertainty in the results and sometimes to retrogression.

PROMISCUOUS BREEDING.

What may be termed promiscuous breeding, is the style of breeding most commonly practiced. The average farmer chooses a sire from a certain breed, it may be on the ground of convenience or because the breed for the time being is popular. Soon another breed becomes popular and a sire is chosen from that breed. It may be that in a life time sires have been used from half a dozen breeds.

Now see what this means. Suppose, for instance, a pure Jersey sire is mated with a grade female of breeding that is much mixed, far more than 50 per cent. of properties in the progeny will be inherited from the Jersey. Suppose that now a pure Holstein sire is used in mating with the female thus begotten, the progeny will possess more than 50 per cent. of Holstein properties, but the Jersey properties will be proportionately eliminated. Suppose, again, that pure Shorthorn sires are chosen to mate with the grade Holstein males Holstein properties will be proportionately reduced and the Jersey properties will be still further eliminated. Those who breed thus are like the man who, as he walks up the hill, walks down again, or like him who sails continuously in a circle. At the end of a lifetime of such breeding the breeder will find himself just where he was when he started.

Up-grading is the true system of improving live stock. Cross-breeding, that is the mating of two distinct breeds, should have but little place in the operations of the farmer. It may be advantageous in some instances as when the dams and their progeny are to go to

the block. It may be profitable for instance to cross aged Merino ewes with males of some better mutton breed and to prepare both for the market by fattening them on rich pastures, but ordinarily such crossing should stop with the first cross. To carry it further would, probably, for a time at least, introduce elements of reversion.

But, it may be asked, are there no instances in which alien blood may be introduced with animals that have been up-graded? There are such instances as when the animals thus graded have partially lost some useful property or properties. It is possible to restore those properties or at least to improve them greatly in some instances by the introduction of an outcross, that is by making one cross from sires of another breed.

This may be illustrated in the condition of many of the high grade herds of Poland Chinas in the corn belt at the present time. Many of these have too little bone, too little stamina and weakened breeding properties. One cross from sire of either the large Yorkshire or Tamworth breeds would lead to wonderful improvement along these lines. The breeders could then fall back again upon Poland China blood if they desired to do so. Such teaching may sound like rank heresy to some, but that it rests on a sound basis will be found by all who put it to the test.

The way to improve the average stocks of the country is, therefore, so plain that any can understand. It is so entirely feasible that all may practice it, and it is so inexpensive, comparatively, that every one may adopt it. But the thought should ever be present, that in all up-grading the food must be adapted to the needs of the animals, otherwise the improvement sought will be hindered in proportion as such adaptation is lacking.

The CHAIRMAN: Now gentlemen, if there are any questions that you want to ask the Professor, this is the opportunity. He is here as he has said, to help us all he can.

DEPUTY SECRETARY MARTIN: Mr. Chairman, I would like to inquire, since dairying is one of the most important industries of Pennsylvania, if it is wise for a dairyman in building up his herd, to use a sire in what we call line breeding?

PROF. SHAW: Yes, I think it would be wise as long as he does not reach the danger line, the line of individual deterioration, or lack of stamina, or loss of vigor; I think it is perfectly safe until that point is reached.

MR. WELD: I would like to inquire of Prof. Shaw what his views are, if we take an ordinary cow—if we wish to build up in a certain line, and get a good thoroughbred sire of some desired breed, how many crosses is it safe to make with that sire; how long is it safe to keep him before you get another one from a different family?

PROF. SHAW: I will answer that question in this way. Understand, gentlemen, that I was not advocating inbreeding for the ordinary farmer. Now this question bears upon inbreeding rather than upon line breeding; the two things are different. Now I would answer the question in this way, that if a man has a herd of rugged cows, and if he chooses a sire that is rugged and right, that he can

with profit use that sire on two generations, but unless those conditions are present, he might make a very serious mistake. Now the ordinary farmer does not observe closely enough to enable him to do these things right, and for that reason I do not recommend the ordinary farmer to practice inbreeding at all.

The SECRETARY: Isn't it true that if you have vigor and stamina and strength on both sides, that by inbreeding you are likely to intensify it?

PROF. SHAW: Yes, exactly.

The SECRETARY: And if there is some weakness you are likely to intensify that weakness?

PROF. SHAW: Yes.

The SECRETARY: You think it to be dangerous to undertake inbreeding without special study and qualifications for it?

PROF. SHAW: I think so; I never recommend it to the average man who has not given attention to this question.

DEPUTY SECRETARY MARTIN: Would it be a good practice for a man having thoroughbred Jersey cows, to use a thoroughbred Guernsey sire for these cows?

PROF. SHAW: That would depend on what he was seeking to accomplish. If he intended to go on breeding Guernseys I see no objection to it, but to introduce Guernsey blood once and then go back again to Jersey, I do not see any reason why he should do that.

MR. HUTCHISON: Don't you think he would do better to breed along the Jersey line?

MR. SHAW: Yes, by proper selection; that is my way of doing it.

MR. HUTCHISON: How do you account for breeding a mare weighing 1400 pounds and getting a big, rough animal weighing 1800 pounds?

PROF. SHAW: What was the breeding of the mare?

MR. HUTCHISON: I don't know about that.

PROF. SHAW: There I imagine would be the difficulty. If the ancestry of that animal was not known, it is probable that some one of the ancestors was of that character, and this possibly would be an instance of reversion of that kind.

The SECRETARY: Is there any way in which a breeder can control or influence sex? What I mean is this; you know that a man who is breeding for beef wants males, and a man who is breeding for dairy purposes, wants females.

PROF. SHAW: Practically, I would say, no. Now, when I say that I do not want to be understood as saying that a man can do absolutely nothing with reference to that; I do not want to say that, because I am inclined to believe that stamina and vigor have some influence, but not enough, to make it absolutely certain that

in all cases you are going to get what you want; I think they have a little influence. I think that nutrition has a little influence, but it works so uncertainly that it is difficult to say that we are going to know what we are going to get. You will notice that at some seasons lambs come almost entirely males, at other seasons they come almost entirely females. I cannot think that is the result of blind accident; I cannot help but think there is something in the character of what those sheep feed on that exercises an influence, but after all, there is so much of uncertainty, that I question very much whether it is worth any man's while to spend his time on it.

MR. HUTCHISON: Isn't that one of the mysteries that has never been solved?

PROF. SHAW: It may be deemed one of the mysteries that has never been solved, and I almost think, for the sake of the human race, it is a good thing that it has not been solved.

MR. HERR: Some of our dairymen breed from a Jersey sire and a Guernsey dam, with the idea of using the dam to get quantity, and the sire for quality, when they are breeding particularly for milk purposes.

PROF. SHAW: I imagine to a certain extent they will get both. But what are they going to do next time? If they go on with the Jersey sire, in a little while their animals will be virtually Jerseys. By simply making one cross I think they can get to a considerable extent what they want.

MR. RODGERS: How many crosses on Holsteins can you make before they will be pure bred Jerseys, starting with a Holstein dam and a Jersey bull?

PROF. SHAW: It would be several generations, because you see, the dam, to begin with, was purely bred; there would be a greater power of resistance. It would probably take a number of generations, probably two or three or more.

The SECRETARY: I have heard the statement that there is not any danger with pure bred sires until you reach the sixteenth generation. Is there any such limit fixed by principles you have any knowledge of?

PROF. SHAW: No, I do not think so; I do not think that is correct.

PROF. HAMILTON: What value would you place upon the Guignon theory?

PROF. SHAW: I do not lay much stress on it—on its possession. Suppose you had two animals that were exactly evenly matched except in that one particular, I would give the preference to the one that had those indications in a marked degree over the other.

A Member: Do you believe the secretions would indicate the butter fat contents of the milk?

PROF. SHAW: I think so, to some extent. I would not say that they would be an absolute guide, but I think they are to some extent an indication.

A Member: Has the time of service of the female anything to do with the progeny, whether male or female?

PROF. SHAW: Absolutely nothing.

A Member: I did not understand the question.

PROF. SHAW: The question was as to the time of heat in a female, whether it has any influence in determining sex. I say absolutely none. Now when a male is running with the females of the herd we can naturally suppose that the service takes place at the earliest time possible. Now what do you find? We find some seasons that almost every animal born is a male, while in other seasons in the same herd, almost every animal born is a female.

The SECRETARY: So that the theory that if you want males, you must wait until the period of mating is nearly closed, goes for naught also?

PROF. SHAW: Exactly so.

MR. HUTCHISON: Is it not true that some cows will have almost all male calves, and others almost all female calves?

PROF. SHAW: That is certainly true; some cows will produce nearly all males, some almost all females, then on the other hand, some sires will beget a great preponderance of females and other sires a great preponderance of males. What the reasons are, we do not understand.

A Member: In this question of cross-breeding, isn't it a fact that in crossing the Jerseys and Holsteins, we are likely to get a progeny partaking more of the Jersey qualities than of the Holstein?

PROF. SHAW: I have not had experience or observation sufficient in connection with line of breeding to answer that question satisfactorily to myself.

MR. HERR: Which would you say was the better, to cross the Jersey male with a Holstein female, or the reverse?

PROF. SHAW: That depends upon what you want, and it depends to some extent also on the individual animals, how that thing should be done. Now I would answer that question in a general way by making the statement that sometimes it has been found better to use the sire of one breed for that crossing, and the dam from another, where it can be done, as the results have shown that that is the best way of doing it. But to reason beforehand that it would be so, would be an impossible thing; the fact has been observed, but the reasons for the fact are not known.

MR. WELD: In breeding can we influence the size or the number of offspring in any way?

PROF. SHAW: I would say that I think we can influence the number of offspring in the litters from swine, and I think we can in sheep, by the way in which we manage the mating; I think we can influence it to some extent, probably not to the extent that we desire. It has been noticed that when both sire and dam are improving at the time of mating—that is to say they are building up, they are getting more flesh, they are gaining in vigor, they are likely

to produce a more numerous progeny than if they were not in that condition when they are mated.

The SECRETARY: In feeding swine, don't you think if brood sows are fed on foods that are rich in protein, that it will increase the progeny?

PROF. SHAW: Yes, and that is a matter of breeds, also.

DR. SCHAEFFER: I would like to know what in your opinion is the difference in the weight between the Jersey and the Guernsey family—the average?

PROF. SHAW: I think it would not be less than a full hundred to a hundred and fifty pounds; of course we can only answer that approximately.

A Member: I want to ask you whether breeders pay any attention to the so-called Mendel's law in biology. The Dean of Illinois University told me not long ago that Burbank of California ignores Mendel's law altogether in improving the fruits and flowers that made him famous. Now is there any attention paid to Mendel's law in breeding?

PROF. SHAW: In practical breeding I do not think there is by the ordinary breeder. There may be a few scientists that are giving it some attention, but that law, so far as applied to animal life—it is advantageous in a tentative stage to consider it, but it is not universally accepted by practical breeders; I do not think it is practical at all.

A Member: Can you state what Mendel's law is?

PROF. SHAW: Well, gentlemen, I am not going fully into that, for there is not time, but in breeding, the transmission takes place as it were, in physiological units. To illustrate, suppose you get a sire that has no horns; probably his ancestors in a near generation may have had horns. Now in ordinary reasoning, we imagine there would be some danger that when that sire is used, that his progeny would have horns. Now according to Mendel's law, that sire can reproduce horns because of the character of the transmission which he has inherited.

A Member: On that question of mating Holsteins and Jerseys, I would like to inquire how many ever saw four or five good cows produced from that cross in the same herd?

PROF. SHAW: You are talking now about crossing pure breds, are you?

A Member: Yes, the question was asked whether you could do it and get the quality of one and the quantity of the other. I say, how many ever saw four or five good cows produced in the same herd from that crossing?

MR. HERR: It is a custom, I know, among some of our dairymen who are selling milk. Their idea is to get very rich milk and yet have a good deal of it, and they cross Jersey sires with Holstein dams, and for the first generation they seem to reach good results.

They are not breeders, but they simply keep the Jersey sires for the purpose, and I wanted to know whether it was a good or bad practice.

PROF. SHAW: Mr. Chairman, there is this feature of breeding which is very important; take it in the raising of sheep. Now suppose you began with a Lincoln sire instead of a Southdown, and you kept your sheep in those mountains where the pasture is so short that the sheep would have to skip about and go all day in order to get enough pasture. You would probably find that you would succeed poorly in doing that thing, because the Lincoln cross would give an impulse in the direction of size, which the food did not sustain. You have got to give attention to the question of feed, that you give to the animals when you set out to make these changes.

MR HERR: I would like to ask the Professor if the first impregnation in a heifer or cow will influence subsequent impregnation.

PROF. SHAW: A first impregnation in a female does sometimes influence succeeding impregnations; a first impregnation of a female does sometimes influence every succeeding impregnation; a first impregnation in a female oftener does not influence any other impregnation. The certainty of influence is stronger in proportion to the prepotency of the sire causing the first impregnation.

The SECRETARY: Then if we have been raising mules, we can take the same mare and raise horses without having any fear that they will be influenced by the original impregnation?

PROF. SHAW: I would say that is probably the strongest illustration of the influence of the first impregnation on the progeny. In mules you will find that stronger than any other kind of breeding that I ever heard of or read of.

MR. HERR: I had a heifer bred of horned stock, and she at first produced a calf with horns; at the next impregnation, she seemed to have bred way back and produced a muley calf.

PROF. SHAW: Did she go on in that way?

MR. HERR: No, nothing subsequent to that that I know of.

PROF. SHAW: That illustrated the influence that you referred to.

MR. RODGERS: On the question of color, will it have any influence upon the color of a colt. Suppose at the time of the conception of a mare, an object of a certain color appears before the mare, is there or isn't there danger that the progeny may inherit some of those color characteristics?

PROF. SHAW: I would answer yes; sometimes there is. The danger is considerable, but of course in a great preponderance of instances it does not follow, but it does follow often enough to make the matter of importance on the part of the man who is breeding good and valuable stock, for that sort of thing should be avoided.

A Member: At what period of conception may that thing take place, Professor?

PROF. SHAW: Well, I imagine that it must take place about the time of the conception. There are other influences, of course, such as the influence of some sudden, mental impression on the mind of the pregnant animal. That influence may take place a good long while after conception.

MR. SEXTON: You have been talking about breeding animals for the dairy. Now in breeding animals for beef, is it necessary to be as careful in breeding for beef as it is for the dairy?

PROF. SHAW: I would answer that in the affirmative; but would qualify it by this statement, that I think it not so difficult to breed for beef as to breed for the dairy, because there are additional factors that have to be considered in breeding for the dairy. In breeding for beef, it is largely a question of form and quality.

MR. HUTCHISON: I move that a vote of thanks be returned to Prof. Shaw for his able and instructive address that he has given us this evening.

MR. HALL: Will the gentleman who made the motion accept the amendment, and make it a rising vote of thanks?

MR. HUTCHISON: Certainly.

The motion was duly seconded and agreed to by a standing vote.

On motion, the meeting adjourned until to-morrow morning at 9 o'clock.

Harrisburg, Pa., Thursday, 9 A. M., January 25, 1906.

At the designated hour the meeting was called to order by the Chairman, whereupon the following proceedings were had:

It was announced that the committee on specialists were not quite ready to report. Also that the report of the Executive Committee would be presented a little later.

The CHAIRMAN: The next number on our program is the Report of the Chemist, Dr. William Frear, of State College, Pa.

Dr. Frear read his report as follows:

REPORT OF THE CHEMIST.

BY DR. WILLIAM FREAR, *State College, Pa.*

NOTES ON MOLASSES FEEDS.

Until recently, the waste products from the manufacture of human food, vegetable oils, etc., that have been offered for sale in the cattle food markets have been distinctly nitrogenous in composition. The principal exceptions were oat hulls, sold under the name "oat feed," cob-meal and cotton-seed hulls. These nitrogenous by-products were welcomed as a means by which we might conveniently and cheaply cause our winter feeds to resemble more closely in composition the pasture ration of spring and early summer. We are rapidly learning, however, that by the proper use of leguminous seeds and roughage, we may both improve our rotations and decrease our bills for protein purchased from the feed dealer.

An interesting tendency in the opposite direction is now manifest. Within the last fifteen years—indeed, much more recently in America—a series of factory wastes, low in protein but rich in highly

digestible, nitrogen-free extract—sugars and pentosans—has appeared upon the market, the molasses feeds.

The importance of molasses as an available factory waste may be appreciated upon considering the following facts: Spencer states that in 1898, Germany threw away 138,816 tons of molasses derived from the beet. Beet molasses is too black and bitter for table use, and, in spite of the large development of the manufacture of cattle foods and alcohol based upon it, there remains a very large unused surplus. The United States has a rapidly developing beet sugar industry. In 1900, we grew nearly 800,000 tons of beets from which 163,500,000 pounds of sugar and 3,500,000 gallons of molasses were made. Of this molasses but a small part found a market. The molasses produced from the sugar-cane is also to be considered in this connection. Owing to the improved methods by which the juice is made to yield a larger fraction than formerly of its sugar in a crystallized form, the molasses has been made less desirable for table use. There is, therefore, a large amount of inferior molasses that might be employed for cattle food. In 1899, from 2,000,000 tons of cane we made about 320,000,000 pounds of sugar, 2,500,000 gallons of syrup and 11,700,000 gallons of molasses. At the present time, the wholesale quotations for inferior centrifugal molasses on the New Orleans market is seven cents per gallon; the lowest grade, "black strap," probably costs from three to four cents per gallon.

A brief consideration of the origin of molasses may give us a better notion of its feeding value. In the manufacture of sugar from the beet, the washed root is chipped and extracted with warm water, thus affording the two products, beet-pulp and diffusion juice. The former contains the fiber, most of the pentosans, protein, wax, and the insoluble ash; the latter, the sugars, soluble nitrogenous constituents, acids, gums and ash. The juice is purified by boiling, skimming and filtering and is then evaporated to such degree that the sugar will separate by crystallization. From these crystals, the liquid molasses is removed by centrifugal action.

Cane molasses is produced in a very similar way, except that ordinarily the juice is separated from the cane by pressure, leaving as a solid residue, the crushed cane or "bagasse."

The chief differences in the two products are due to the original differences between the sugar beet and the sugar-cane. The average composition of beet molasses, as stated by Kellner, and of cane molasses, as stated by Browne is as follows:

	Beet molasses. Per cent.	Cane molasses. Per cent.
Water,	22.50	23.66
Ash,	7.10	9.13
Organic substances:		
Cane sugar,	51.50	26.89
Dextrose,	[.20]	14.27
Levulose,		15.58
Albuminoids, .....	.78	.39
Amids,	9.50	2.49
Other organic solids,	8.42	8.19
	100.00	100.00

At four cents per gallon of 11.8 pounds, this would correspond to a cost per 100 pounds of dry matter, in black strap cane molasses, of 33 cents. In 1900, the market price of beet molasses in Europe was about one-half cent per pound, making the cost of dry substance about 64 cents per 100 pounds.

Certain special characteristics not clearly set forth in these analytical statements should be understood. With reference to the nitrogenous matters: Cotton-seed meal, linseed meal, gluten feed, wheat bran, and middlings, indeed all seed products, contain their nitrogen in albuminoid form, the form most highly valued for feeding purposes. In the molasses, on the other hand, only a small fraction of the total nitrogen is present in this state of combination, the major part being contained in the so-called "amid" substances. In this respect, the molasses resembles the root or cane from which it is derived, and shares the characteristics of pasture grass and all the more succulent foods. It is an interesting fact, that our domestic animals thrive especially well on these green foods, and yet, until very recently, the most careful experiments with the amid bodies, have failed to establish any value for them as nutrients. Since they are formed in the breaking down of albuminoids in the intestine and, in the plant, are intermediate products from which the albuminoids are built up, it has seemed strange that their nutrient value should appear so small. Within a year or two, however, evidence has begun to appear that our earlier experiments were at fault in their method. When an albuminoid is broken down, it always yields more than one kind of amid. The earlier experiments were, however, attempts to build up albuminoids from a single amid, and resulted negatively. Several experimenters have now tried to form albuminoids by starting with several amids, and appear to have succeeded. If their success should be fully confirmed, the valuation of succulent foods and also of the molasses feeds will be considerably increased. Berger found the nitrogenous matters of the sugar-beet molasses inferior, nevertheless, to protein, in rabbit feeding.

Both sugar-beet and the sugar-cane contain nitrates. The leaves of these plants are often quite richly supplied, and injury to stock has appeared because of the effects of the nitrates. Further, when the wastes from the manufacture of alcohol from beet molasses are dried and burned to recover the potash in them, violent explosions sometimes occur, owing to the nitrates present in these wastes. As saltpeter, the nitrate probably present, acts vigorously upon the kidneys, many have feared that the molasses might contain enough saltpeter to cause ill health in animals eating the article in considerable quantities. Many authorities state that about one-sixth of the nitrogen in beet molasses is present as nitrate. The results obtained by different analysis show wide variation in this respect; thus Pagnoul found in 120 samples of molasses an average of 1.31 per cent., while Kellner reports only 0.2 per cent. as present in average beet molasses. Browne states that about one-thirteenth of the nitrogen of cane molasses is present in the form of nitrates, equivalent to about .27 per cent. of saltpeter in the molasses. There is no evidence, however, that serious injury has resulted from the amount of nitrates present in the molasses used for cattle food.

In respect to the composition of the ash, molasses differs materially from seed products and also from leaves and stalks. In the

former, potassium and phosphoric acid are especially abundant, lime, however, being present in considerable amount; in the stalk and leaf, on the other hand, lime is the more conspicuous ash component. In the case of beet molasses, the quantity of potash varies from 50 to over 70 per cent. of the pure ash, common salt being next in importance; while there is very little lime and a especially small quantity of phosphoric acid present. The same statement applies with little modification to cane molasses, the amount of potash being somewhat less.

The nitrogen-free extract of molasses is distinctly more digestible than that of seeds, whose starch must be converted by the digestive processes into water-soluble substances before it can be taken up by the body. Of the nitrogen-free extract in beet molasses, all but one-eighth is composed of sugars, chiefly cane sugar. In the cane molasses, the true sugars form eight-ninths of the nitrogen-free extract, but over half of the sugars present are invert sugars. In each case, about eight per cent. of other organic solids is present, composed of gums, acids, etc., concerning whose feeding value we have no very definite knowledge.

For convenience, it may be well to remember that a gallon of heavy molasses weighs about 11.8 pounds.

Let us now consider the evidence with respect to the use of molasses as a cattle food. It has been quite largely fed in the liquid state in the regions where molasses is produced. For this purpose, it is commonly diluted with three or four volumes of water and served either as a drink or pouring upon cut straw or hay. In either way, the stickiness of the mixtures has been found objectionable. The animals have been hard to keep clean, and the molasses adhering to their bodies and to the mangers has attracted insects in a very annoying manner. Attention has, therefore, turned to the preparation of dry molasses feeds by the use of absorbent materials that take up the molasses and form with it a dry product convenient to handle and capable of easy transportation and preservation. A great variety of products of this character has been offered upon the market. Some of the absorbents have been highly nitrogenous feeding substances, such as cocoanut and palm-nut meals, dried blood, brewer's and distiller's grains, maize germ, wheat bran and dried curd prepared from skim milk. In other classes, absorbents composed more largely of carbohydrates are used, such as potato pulp, Marsden feed (prepared from the outer portion of the corn stalk), and also much superior substances such as sugar-cane bagasse and sugar-beet pulp. In the third class may be listed absorbents quite worthless as foods, such as turf or peat, cocoa shells, peanut hulls, coffee hulls, and chaff of various sorts. Respecting the turf, while it is admittedly an excellent absorbent, it must be stated that Kellner found it to lower the digestibility of the molasses, apparently because it carries away some undigested material so rapidly into the rectum that it escapes the attack of the digestive agents. Maereker has, however, commended it in the case of feed for swine, because it gives the manure a better consistence and prevents the development of the disagreeable odors commonly produced in such manure by the formation of butyric acid.

Beet pulp is one of the most important absorbents. Numerous trials in Europe as well as in Colorado, Utah and California, have

demonstrated its value for steers and sheep, about 24 pounds of the pulp being equivalent in effect to two pounds of mixed grain. Owing to its weight and consequent cost of transportation, the use of this material is confined to the immediate locality of the beet-sugar factories.

It has, however, been found practicable to dry this pulp for transportation, and since it is now offered on American markets in this condition, it deserves a passing word respecting its composition and feeding value. The pulp made by the Alma Sugar Company, of Michigan, has been found to contain:

	Per cent.
Water,	6.09
Ash,	5.64
Protein,	9.75
Fiber,	15.77
Nitrogen-free extract,	61.94
Ether extract, .....	.51
	<hr/>
	100.00
	<hr/>

The ether extract in this case is not fat, and the nitrogen-free extract is largely composed of pentosans. Digestion experiments made in Europe show that from 74 to 80 per cent. of the organic substance is digested, the digestibility of the protein being from 50 to 63 per cent. and that of the remaining constituents much higher. Schmoeger sums up the results of European experience in feeding the dried pulp as follows: The dried chips form as appetizing food useful for all domestic animals and are commonly eaten by them without reluctance. It is often thought best to moisten them with water a short time before feeding. This is especially true in the case of sheep which swallow the dried chips with such eagerness that they sometimes form balls in the digestive tract which swell and produce stoppage. The quantities that may normally be fed per head per day are for sheep, four-fifths of a pound; heifers, 2.2 pounds; milk cows, 6.6 pounds; draft oxen, 8.8 pounds; and oxen and cows on maintenance, 11 pounds. These quantities may in most cases be increased by 50 per cent. without injury. The feeding value may be roughly estimated from the fact that it takes eight pounds of the wet pulp to make a pound of the dry material.

The quantities of molasses taken up by various absorbents differ much from one another. The cocoanut and palm nut cakes, brewer's grain, etc., take up about 150 pounds of molasses for each 100 pounds of the absorbent, bran only 100 pounds. One hundred pounds of turf meal will absorb 300 pounds of molasses; dried beet pulp, 33 to 67 pounds of molasses; dried bagasse, 400 pounds of molasses. The molasses is usually heated above the boiling point of water so that it may be absorbed more readily, and in many cases, the moist beet pulp and bagasse are mixed with molasses, and the mixture subsequently kiln-dried.

The molasses feeds tend to ferment if they contain more than 20 per cent. of moisture, though turf molasses will bear 25 per cent. Browne reports that blood molasses becomes putrid in the moist

climate of Louisiana, so that it cannot satisfactorily be kept there. When the feeds become over moist, they ferment, part of the sugar is inverted, and there is a tendency to sourness and moldiness.

Much interesting study has been devoted to the nutritive value of molasses, either fed alone or when used in combination with the various absorbents above named. Time will permit only a brief summary of the work of the last fifteen years upon this subject. Some of the most conspicuously satisfactory results have been obtained with *horses and mules*. Numerous observers report it to be appetizing and to keep the animal in sleek, vigorous condition. Welborn states that the 400 pound Filipino pony compares favorably in endurance with the Texas mustang, yet receives only a little "dulce," or diluted molasses, and grass, with an occasional ration of rough rice. Griffin maintained hardworked army horses in Porto Rico on 13 to 15 pounds of molasses and 35 pounds of grass per day per 1,000 pounds live-weight; their condition improved. The New York *Sun* reports that the heavy teams (1,700 or 1,800 pounds) of a Brooklyn sugar-refining company were kept in prime condition at hard work on a ration of one and one-half quarts of cornmeal, one quart of wheat bran, several pounds of cut hay and one and one-fourth quarts of refinery syrup in the morning; four to five quarts of oats at noon; and a repetition in the evening of the morning ration with an addition of five pounds of loose hay. The cost of this ration was 34 cents per day, *vs.* 42 to 44 cents for oats and hay alone. Animals in run-down condition quickly regained weight. Grandeau, from his observations on Paris cab horses, reports that heavily worked horses, when fed with a mixture of straw and beet molasses in amounts equal to 5½ to 8 pounds of molasses per day, all gained weight; that the total ration cost but 28 cents per day, instead of 44 cents for the usual grain ration. Berns, experimenting with growing horses, heavy truck animals and driving horses, found that all improved when one quart of beet molasses diluted with three quarts of water and mixed with five pounds of cut hay were used; that one quart of molasses at 3 cents replaced three to four quarts of good oats costing 4.5 to 6 cents, and resulted in a total reduction of food cost of 25 to 33 per cent.

Dr. Dalrymple, Veterinarian of the Louisiana Experiment Station, recently reported the results of an investigation into the Louisiana plantation practice. Reports from 42 plantations showed that 2 to 21 pounds of black strap molasses was fed per day per head; average, 9.5 pounds. The saving in cost is estimated variously at 10 to 60 per cent., in comparison with the cost of the usual grain ration; in particular instances, a saving of 15 to 21 cents per day is reported. One plantation keeping 177 mules estimates a saving of \$6,000.00 in one year from molasses feeding. Digestive disturbances, colic in particular, were greatly diminished, as other observers have noted. The cane molasses is somewhat constipating, but a little bran readily corrects this tendency. When mixed with whole grain, it leads to imperfect mastication; therefore chop should be used with it. No injury to the animal's teeth is shown to occur.

For *fattening steers*, Kellner concludes from his experiments, that the organic matter of molasses is as valuable as starch. Dickson and Malpeaux found that an addition of one and one-half pounds of molasses caused in 20 days a net gain of 10 pounds weight on 2 year

old steers. Maercker especially commends molasses feeds for these animals, and states that three to four pounds per day can advantageously be used.

For *sheep*, Maercker recommends eight pounds of molasses feed per 1,000 pounds live-weight; Stein, 10 to 14 pounds. Ramm reports feeding eight pounds of beet molasses or 10 pounds of peat molasses feed per 1,000 pounds live-weight, without injury. He reports a comparison of barley meal, molasses and peat-molasses feed, added to a basal ration in such quantities as to furnish equal amounts of nitrogen-free extract. The gain in live-weight on the barley ration being taken as 100, that on molasses was 82, on peat-molasses feed, 72; that of wool: barley 100, molasses 73, peat molasses 56. In the carcass, the barley ration produced more muscular tissue and fat; the molasses, more dry matter and ash; the melting point of the fat was lower in molasses-fed sheep than in those given barley; the profit, greatest from the molasses ration.

Albert and Linfield severally report experiments with *fattening lambs*, and state that beet molasses and molasses feeds are rational feeds for these animals. The former states that molasses is not so good alone as when mixed with grain, and that a large increase of the nitrogen-free extract in the ration is not profitable. Linfield obtained 14 cents more per head for grain-finished lambs than for those molasses-fed. C. Gerland also reports excellent results, the addition of 9 pounds of molasses to the ration per 1,000 pounds live-weight, caused a gain of 37 pounds live-weight in 10 days.

For *fattening swine*. Friis compared a molasses feed (one-eighth palm-nut meal, three-eighths wheat bran, four-eighths beet molasses) with barley and maize and considered it of nearly equal value. When maize was used alone in comparison, molasses gave a smaller, but cheaper gain. The fat produced by pigs on the molasses ration was intermediate in firmness between that produced by the maize and barley rations respectively. Blood molasses was, however, quite inferior; the pork was poor, the fat soft; so that the carcass was worth 1 to 2.7 cents less per pound on the English market, than that from grain-fed hogs.

Lilienthal reports a like result with blood molasses. Faye and Fredericksen found molasses nearly equal in nutritive value to barley for 50-pound pigs, and cheaper; from repeated experiments, a lower value, about three-fourths that of grain, was assigned; the gain in weight was less per day and per pound of food consumed. The fat was firm, however, and the meat excellent.

Gerlach, and Dickson and Malpeaux report a very rapid gain from the use of molasses feeds. Klein regards molasses as worth about four-fifths as much as mixed barley and maize.

Lehman states that bad results have attended the use of beet molasses with sour milk.

In a single instance only is serious injury reported. Branté states that three pigs, seven to nine months old, sickened and died after three weeks' feeding upon a palm-nut-bran molasses feed. He supposes the cause to have been the injurious influence of the potash salts in the molasses.

Experiments with *cows* have led to somewhat contradictory results. It is recognized that somewhat more care is needed in using molasses with these animals than with other domestic stock. Es-

pecially is this considered desirable in the case of cows with calf. Maercker recommends the use of $2\frac{1}{2}$ pounds per 1,000 pounds live-weight. Wahlquist states, however, that he has fed as much as 9 pounds of beet molasses without apparent injury; Hoppe, 11 pounds; and Ramm, 17.6 pounds to cow with calf, with no ill effect; while Bäcker states that 9 pounds of palm-nut molasses feed containing almost equal parts of palm-nut and beet molasses, caused severe scouring. Not all cows eat molasses or molasses feed with relish. It is needful in most cases to introduce it gradually. Respecting the influence on the flavor of milk and butter, no unfavorable results have been found. A number of experimenters report that these feeds caused no increase in flow, but an increase in the richness of the milk; others report the opposite effect.

As to profit, Weigmann states that during one month turf molasses was found equal in nutritive effects to wheat bran. Ramm found cocoa-hull molasses deficient in nitrogen, causing a decrease in milk flow; even when protein was added, the live-weight fell off. Potato-pulp molasses feed was not eaten at all readily; indeed, molasses alone was more completely consumed than when mixed with other feeds. None of these feeds equaled barley meal in nutritive effect.

The Alnarp College, Sweden, reports that two and three-fourth pounds of molasses produced a better milk flow than two and one-fifth pounds of oats and barley, but less gain in live-weight. B. Schulze reports that maize-germ molasses feed gave about the same results as field beets and wheat bran. Ramm replaced 11 pounds of peanut cake by an equal weight of maize-germ molasses without decrease in the milk yield.

The cases of sickness following the use of molasses feeds are more numerous for cows than for other classes of farm stock.

A number of experimenters have endeavored to determine the respective nutritive values of the different molasses constituents. Ramm compared molasses, sugar, and sugar to which the ash of molasses had been added; the milk flow decreased rapidly when the latter were substituted for molasses in the ration; but sugar plus molasses distillery-wastes was found equal to molasses; whence he concludes that the organic non-sugars of the molasses are of considerable nutritive importance. The feeding of sugar instead of molasses did not seriously diminish the total milk flow, but did injuriously affect the fat percentage.

Kellner, in his experiment on steers, found the organic matter of molasses equal to starch in maintenance and fattening effects, and 25 to 30 per cent. superior to sugar in the latter respect.

Meissl found molasses even superior to the starch of barley in maintaining swine, and far better than sugar. He inclines to attribute this to the influence of the non-albuminoid nitrogenous substances present, although there is no direct proof favoring them rather than the other non-nitrogenous substances other than sugar.

The interesting observations of Nicolas may be added: That in experiments where the substitution of molasses for concentrated feeds had caused a diminished milk flow, and fat richness, the addition of phosphoric acid, in which molasses is deficient, to the ration, was followed by a return of normal milk flow and quality.

In conclusion, it may be well to add a word of caution. The ingredients of the molasses feeds are so difficult to distinguish, so many

worthless materials have been used in their manufacture, so many viable weed seeds have been found in them, that the purchaser should be more than ordinarily cautious in his inspection, and require guaranties with respect to more points than the percentage of protein and fat. When well made, normally sold and judiciously used, they bid fair to be an excellent addition to the dietary list, especially for our horses and fattening stock.

The CHAIRMAN: Questions are now in order.

MR. CLARK: Mr. Chairman, I would like to ask Dr. Frear how it would do to buy the molasses and mix it with our chopped feed.

DR. FREAR: You can do that, but unless you mix it at a rather high temperature, you get a sticky mixture. They make machines especially for that purpose; they are sold more largely in Europe, however, than they are in America.

MR. HUTCHISON: Mr. Chairman, I would just like to give a little experience along that line, a thing that I came across; it relates to this molasses feed. In the city of York there is a gentleman who is selling quite a good deal. He sold four carloads last winter, three of the carloads sold gave good satisfaction, but the fourth was sold on towards Spring, and it became so packed and musty that the animals wouldn't eat it, and that condemned what he sold before. There is no doubt that the feeders there buying the goods were very much pleased with it and had good results. If you get it good and feed it fresh you get good results. I came across some men using it for feeding mules. One man in Columbia, who mixed it with his oats and obtained good results. The trouble is to get the goods fresh that you buy. It will become compact and sour in the sacks, otherwise, and difficult to get out.

DR. FREAR: It is found in Europe that if these feeds have more than 20 per cent. of moisture they will get musty and sour, and the cane sugar in them will be changed and become practically unfit for use, so they have fixed that at a maximum standard. It is necessary to keep these feeds in a dry place, as they absorb moisture readily, and when they have an excess of moisture, they are unfit for use.

PROF. COOK: Good results have been obtained in this country by mixing with cotton-seed meal and in that way increasing the nitrogenous material, and I think with a good law one would be safe to buy the feed.

DR. FREAR: If you are sure that the feed has been examined and tested, I think you are safe, but as I tried to indicate a moment ago, I should never buy a new feed until I knew it had been tested and knew about what it was.

PROF. SHAW: I would like to ask Dr. Frear if he would recommend molasses to any kind of breeding stock.

DR. FREAR: I should say no, for the special reasons I mentioned a little bit ago, with reference to the ill effects of some of the constituents, the possible ill effects. While it has been done a good many times without serious injury, I think the precaution would apply

to the females of their species. I would say that toward the latter part of pregnancy it would not be advisable; in the early part, it might not be so objectionable.

PROF. SHAW: Would you recommend feeding in any considerable quantity, molasses to young animals that are being grown for breeders?

DR. FREAR: Not unless the nitrogenous material is well kept up where it has been given—where the ration has been given with that precaution, a great many excellent results are reported with young and growing animals.

PROF. SHAW: Would you prefer any other kind of food if you had your choice to feed to that kind of an animal, and if so, what would you adopt?

DR. FREAR: Good pasture grass.

It was moved and seconded that Dr. Frear's paper be received and placed on file and published in the bulletin. Agreed to.

The SECRETARY: In the preparation of the program, we had in mind the question of time. One year ago there was a resolution passed that all reports of the Specialists and Standing Committees should be in writing and that fifteen minutes should be occupied in their reading. We will have to be very careful or we will find that we will not get through and we will not have time for questions and discussions.

The CHAIRMAN: The next number on our program is the report of the Mineralogist, Col. H. C. Demming, of Harrisburg, Pa.

The report of the Mineralogist was read as follows:

REPORT OF THE MINERALOGIST.

BY COLONEL H. C. DEMMING, *Harrisburg, Pa.*

The past year has been a momentous one in the mineralogy of Pennsylvania. More minerals have been mined and sold than ever before in the history of the State. The leading resources have been our coals, oils, natural gas, iron ores, limestones, slates, cement rocks, silicates and clays. We also have mines of asbestos, barite, beauzitic clays, bromine salt, corundum, copper, chromite, emery, flint, fluor-spar, fire-clay, Fuller's earth, galena, garnet, gold, granite, graphite, gannister rock, infusorial earth, kaolinite, melanterite, manganese, malachite, magnesia, mica, moulders' sand, nickel, pyrite, peat, quartz and quartz crystal, sandstone, silver, sepiolite, salt, serpentine, shales for brick, strontium ores, umber and zinc. In addition, mineral waters are being produced and sold in unusually large quantities, including chalybeate, lithia and sulphur waters.

The asbestos deposits of southern Lancaster county are mined in-

termittently, and it is to be regretted that no more capital has been enlisted, as the outlook for a profitable industry near White Rock is very good.

The barite deposits of Blair, Clearfield, Franklin, Fulton and Huntingdon counties now and then produce a few tons of rock, and the work ceases for a time. As high a grade of barite as is found anywhere in America occurs near Mont Alto, Franklin county.

The demand for bromine from the salt of our salt wells has increased, and a grade that three years ago brought 20 cents a pound now brings 45 cents. For some reason the industry is encouraged more in Michigan than in our own Commonwealth, and consequently it is lagging here. It could be produced profitably in 38 of our counties, but Allegheny county seems to be the chief point of manufacture or extraction from the crude salt.

During the past year some fine pieces of beryl have been found in a quartz rock locality of northern Chester county. From beryl is extracted beryllium or glucinium, the oxide of which now brings about \$4,000 a pound in European markets. There will be an industry in this field in Pennsylvania this year.

We have much clay in Pennsylvania yielding large percentages of alumina, and nearly free from titanitic acid, especially in Clearfield, Clinton and Lycoming counties. Some of this clay will probably be shipped to Niagara Falls during the present year to be used in the manufacture of aluminum.

Large bodies of corundum were mined in northeastern Berks county, and western Lehigh county, during 1905. Mineral of this character has also been taken from one or two deposits in Chester county. The Lehigh article is of very good quality, as the sample shown here to-day testifies. This mineral is used for corundum wheels, corundum paper, and for other abrasive purposes. In India the finest sapphires and rubies come from corundum beds. Within the past five years very beautiful sapphires have been mined in Montana, and equally beautiful rubies in McDowell and Madison counties, North Carolina; but none thus far in Pennsylvania, except a few perfectly white sapphires in Delaware county, near Chester.

A new industry has been successfully launched by the dredging of the Susquehanna and Schuylkill river beds for coal, carried down from the culm banks of the principal mines of the anthracite. To such an extent has this work been carried on that during last year more than 80,000 tons were taken from the two rivers. The method of pumping up the coal and sand, and the separation of the former from the latter, is quite ingenious and interesting; and the product is very profitably marketed. Plans are now maturing for the briquetting of this fine coal, when the industry will become more firmly established. In Harrisburg and vicinity more than 10,000 tons of the so-called river coal are consumed annually.

Probably the most notable advance in coal mining in this State is taking place in Somerset county. The coal from some of the mines of that county is almost equal to anthracite, a sample from the Boswell mine yielding as follows: Moisture, 0.92 per cent.; volatile matter, 15.26 per cent.; fixed carbon, 79.50 per cent.; ash, 4.32 per cent.; and sulphur, 0.68 per cent. Three years ago Boswell was without a single inhabitant. A census taken at this time would show a

population of at least 2,000 souls. This fact is given as a proof that all of the most rapid growth of population does not take place in the West; and also as encouragement to farmers to remain on the farm; for, with every new industry, mine or manufactory, there is an added source of consumption of agricultural supplies, with a probability of higher prices than heretofore given.

The numerous clay deposits of Pennsylvania are being investigated and developed with more interest and commercial success than heretofore. It is almost certain that a Vermont corporation engaged in the manufacture of fire-brick for stoves and furnaces will have a branch established in Susquehanna county on account of some very desirable clays having recently been found in that part of the State. It is believed they will employ over 400 men.

More effort has lately been given to the mining of copper, owing to the high prices for the metal, than for many years. This commodity has been found in supposable paying quantities in the counties of Adams, Bedford, Lancaster, Lebanon, Montgomery and York during the past twelve months, and considerable capital has been enlisted.

Chromite is found in southern Lancaster county in such quantities that a few carloads are sold every year. Efforts are now being made to increase the output. Chrome yellow, and chrome steel for safes are made from this ore.

Emerald of fair quality was mined last year in Berks and Lehigh counties.

The flint industry is holding its own in Adams, Chester and Lancaster counties. It may be amusing, if nothing more, to know that fully 30,000 flints are shipped from this country every year for old fashioned flint-lock guns in Asia and Africa, and for striking fire. Most of our flint, however, is used for flint glass, porcelain ware, and similar articles.

The best fluorspar deposit thus far found in Pennsylvania is located in Fulton county, near Fort Littleton. Little has been taken out and sold, because of the larger deposits in Southern Illinois; but the time is not far off when the demand will warrant the steady working of the fluorite quarry in northern Fulton.

The galena deposits of Huntingdon county are attracting renewed attention, and on account of the high prices of lead there is a strong likelihood of work in that line in Columbia, Huntingdon and Northumberland counties this year; possibly in Snyder county also.

The ganister rock industry is very prosperously carried on in Blair, Huntingdon and Mifflin counties, and one firm is shipping a thousand tons a month of this rock to Buffalo, N. Y. It is selling at an absurdly low price, about 60 cents a ton on board cars. It is used for furnace linings and silica brick. Our Commonwealth has more silica brick manufactories in profitable operation than any other state in the Union, and the trade is increasing.

Gold has now been found in 27 counties of the State; but seemingly the ores are all too low grade to lead to investment of much capital.

The mining of graphite is now being carried on very successfully near Chester Springs, Chester county, some of the natural product

yielding as much as 90 per cent. pure graphite. There is a fine market for this material, pulverized, at from \$50 to \$150 per ton.

There is more inquiry for Pennsylvania iron ores than for many years. This is due in part to the enlargement of a number of plants, and the erection of new plants, for the manufacture of steel by the basic process, or open hearth furnace.

A fine sample of infusorial earth has been received from near Wellsboro, Tioga county, the owner stating that he has many thousands of tons of it. An analysis has not been made, but the appearance of the mineral indicates that it would be worth at least \$20 per ton, pulverized, and this in carload quantities.

The volume of kaolinities from southern Cumberland county continues to increase. It is much sought for in the manufacture of paper, and especially wall-paper.

So great has been the increase of our limestone traffic that one railroad company of this Commonwealth has hauled from various quarries from 100 to 300 carloads in a single day. New quarries are being opened in a dozen counties, the demand being for both calcium carbonate and magnesium carbon varieties. It is now quite clear that this State produces more than 30 kinds of limestone, some of it crystallized into pure marble.

One of the most notable minerals found within our borders is melanterite, or natural copperas, the body being near Olivet, in Armstrong county. Properly developed, and with sufficient capital, this deposit ought to give employment to more than 100 men at fair wages.

Forty years ago nearly all the nickel used in the United States, including that for coinage, came from the nickel mines of Lancaster county. While the ores are not exhausted, for some reason they are not worked regularly, and competition is now keen on account of Canadian nickel.

The known natural gas area of the State is extended as far east as Wyoming county. There was some excitement on this account at Skinner's Eddy eight months ago; but the well diggers ceased operations before sinking to a proper depth. Small quantities of natural gas have now been found east of the Allegheny Mountains in Berks, Clinton, Dauphin, Juniata, Lycoming, Mifflin and Wayne counties; but in every instance the exploitation was not completed owing sometimes to lack of capital, and at other times to the lack of knowledge or experience on the part of locators.

There is a good opening in southern Snyder county of pyrite, for sulphuric acid manufacture. Most of this mineral now comes from Spain, or our Southern states.

Petroleum is not as plentifully produced in our State as in former years; the known fields having been pretty thoroughly gone over, and most of the oil pumped out.

Attention is now being paid to peat deposits everywhere in the United States east of the Mississippi river, and investigation is now going on in Pennsylvania; but more will be said on this subject in my annual report as Geologist of the Board. The same is also true of quartz and quartz rock.

Shales for brick manufacture are more and more utilized every year. It may be remembered by some of the members of the Board that attention was called to the practicability of shales for brick by

your Mineralogist long before a single plant had been put in operation. There are now dozens of such plants from Monroe county to Butler, and from Bradford county on the north, to Delaware county on the south. Attention was also called before this Board to the cultivation of nitrogenous bacteria; to electrical influence in stimulating the growth of crops; to the vast water-power of the Susquehanna for electrical generation, and to the cadmium nitrate insecticide, all of which are now being practically applied, in two instances, the United States Government acting upon the suggestions set forth in our reports of years ago.

Among the latest mineral discoveries of importance, are very large beds of peat in a number of our counties, especially in Dauphin, Erie, Franklin and Lawrence; also of zinc ores in Franklin and Fulton counties. From some ores of Fulton county that had been melted down in a blacksmith shop, the "button" thus made gave 97 per cent. pure zinc.

Some seem to have the impression that Pennsylvania has been quite thoroughly developed in a mineral way, but the work is little more than fairly begun. Every year something new and valuable will be found, until we more fully understand why our Creator made these lofty, rugged mountains, and beautiful, fertile valleys.

This was followed by the Report of the Geologists.

Col. H. C. Demming read his report as follows:

REPORT OF THE GEOLOGIST. NO. 1.

BY COLONEL H. C. DEMMING, *Harrisburg, Pa.*

QUARTZ ROCK.

In one of the counties of this State there is a farm which has been under cultivation more than 100 years. For 14 years the owner had much difficulty in making ends meet on account of its products. Last July one of his men found and brought to him a piece of whitish rock. It lay on the farm owner's table for weeks, with little or no attention paid to it. A visitor dropped in, saw the whitish-colored rock, picked it up, and examined it. Then he said to the owner, "Have you much of this?" The reply of the owner was that he did not know. Said the visitor, "Why don't you have your farm examined by an expert? This rock may prove to be of value." "Who can make the examination?" A name was mentioned. "Why," says the owner, "I have known that man for more than 20 years, and I never thought of him in this connection." The man was sent for. An examination of the rock deposit was made; samples were analyzed. Then it appeared that the rock was quartz and quartz crystal, and the total rock body more than 250,000,000 tons. The analyses showed that it all yielded more than 99 per cent. silica, a select piece 99.84 per cent. pure. More than a thousand tons were quarried, and within three months thereafter the owner had inquiries and orders for the mineral to the extent of above 200,000 tons, and at a profit of about \$2 per ton, making him substantially a mil

lionaire with so much additional rock in reserve. So desirable is the rock for porcelain, cement, white mortar, concrete and filtration purposes that there is a demand for it both in this country and in Europe. Numbers of men are now at work quarrying it, and soon there will be plants erected for pulverization. It may be that within a year between 200 and 300 men will be regularly employed for mining and preparing this extraordinary material for market. I take pleasure in submitting to you average samples of the rock from a farm of Pennsylvania, considered six months ago about one of the poorest farms of the State, and now perhaps the richest.

POTASH.

A careful study of the areal and economic geology of Pennsylvania has led to the conclusion that potash exists in largest quantities in soils at the base of timber-covered hills and mountains where there has been an annual washing down and settling at the base of the decaying and decayed material from above. Decomposed leaves and wood of trees, and the remains of vegetable growth, all are unusually rich in potash, and an accumulation of these constituents supplies the soil with a comparatively large percentage of that element (potassium) so necessary to some species of plant life, especially potatoes.

PEAT.

Some of our sister states have taken up the subject of peat for fuel with decided vigor. Conspicuous in the list are Massachusetts, Michigan, New York and Wisconsin. In the Dominion of Canada peat is commanding the attention of men of large capital. Large peat beds are now known to exist in Butler, Dauphin, Erie, Franklin, Lackawanna, Lawrence and other counties of our Commonwealth. As has been wisely said by Dr. L. A. Stillings, in the November number of the "Electrochemical and Metallurgical Industry," the great value of peat fuel is unknown to the average person in the United States. We do not yet appreciate the vast resources offered all over the country for a cheap, clean fuel. When we find that the United States has more than 100 times the acreage of peat to that of all Europe, and that Europe has been to a great extent dependent upon peat as a fuel for many years, and, at that, only used up a small portion of its peat bogs, we can see the immense future of such a fuel in this country, either in connection with steam or gas power plants.

The cost of fuel is governed by its heat and waste. The use of both coal and wood is very wasteful, only a comparatively small part of the heat units being utilized. With coal the clinkers, with wood the live embers which drop through the grate, are an additional source of loss. When briquetted peat is first placed on the grate it burns with a short, blue flame, which gradually becomes a yellowish glow. It emits an intense heat, which is easily controlled by draughts. A peat fire will burn until exhausted, and is nearly smokeless and ashless. The smoke of peat, unlike other fuels, is good for the lungs, and serves as an excellent deodorizer.

The approximate percentage composition of peat is: 16.4 per cent. water; 41.0 per cent. carbon; 4.32 per cent. hydrogen; 23.08 per cent.

oxygen; 2.06 per cent. nitrogen; 11.09 per cent. ash constituent, with a specific gravity of 1.05. Sulphur is almost never found. The ash constituent will vary from a small fraction of one per cent. up to 15 per cent., the average of the peats of the United States being 3.07 per cent., while that of the German peats is 7.9 per cent. The poorest sample of peat which has been analyzed in my laboratory gave the following constituents and percentages: Moisture, 10.64 per cent.; nitrogen (2.03 per cent. ammonia), 2.46 per cent.; sulphur, 0.80 per cent.; volatile combustible matter, 40.99 per cent.; fixed carbon, 17.53 per cent.; ash, 27.58 per cent. Total, 100.00 per cent. It will be observed that the ash yield was unusually high, but this was due to the sample having been taken from a part of the peat bog where the sand sediment from an emptying stream had settled. That same bog, in other parts, ought to produce a peat with less than 3 per cent. ash.

Peat is known in general as the rich, dark brown mud found in marsh and swamp lands. However, one should not forget that all rich earth in which plant life grows readily is a form of peat, and will be easily burned after carefully dried.

In the old world peats are mostly composed of decayed mosses and grasses. In this country we have several kinds of peat. The main one, however, is like the European peats, and is composed of decayed sphagnaceæ. On the Atlantic coast there is a variety of so-called "salt march," which produces a peat which would not be of any use for our purposes for fuel; but I have not found any salt march peat in Pennsylvania.

The peat mosses that make up our best Pennsylvania peat are found almost entirely decayed, as a rule, though parts of the peat deposits of Erie county seem to have remained, in some instances, nearly as perfect as they would be expected to appear after one or two years' cessation of growth. Before death occurs sphagnaceæ may be seen growing in more or less compact tufts or patches on the surface of some of our bogs, or floating in stagnant water, and some are on the borders of mountain rivulets. They are soft and flaccid caulescent plants, generally of large size. They are whitish, yellowish, or sometimes red or olive-colored, and are perennial. The branches are generally spreading, in lateral fascicles of from two to seven, rarely more, those at the summit of the stem capitate. The leaves are nerveless, translucent, formed of a single layer of two kinds of cells. In the Erie county peat bogs there has been so little decay in some instances that the lateral fascicles are still on the stems. There are about twenty-five North American species, and many varieties or forms; but this general description will answer for all practical purposes in our State, when any suspected peat bog has been located.

The Dismal Swamp of Virginia is one vast peat bog. We have not a single deposit in Pennsylvania one-fourth its size, although in Lawrence county there are many acres of land underlaid with good peat. Almost all of New England is one mammoth peat bog, which are coal measures in the primary process of formation. All coal has been mud, and, hence, many kinds of mud can now be converted into a substitute for coal.

Peat is best adapted for fuel after the water has been pressed out, and the material briquetted into proper sizes for use. In bri-

quetting almost any other substance, a binder has to be supplied; but in peat there is a substance called "pentosane," which serves as a natural binder under compression.

The cost of producing peat-fuel is very low. There is not a section of Pennsylvania where it cannot be made ready for market at an expense of less than \$2 per ton. There are plants in operation in the United States and Canada where briquettes are made by artificial drying and compressing of powdered peat at a cost of about \$1.30 per ton. Such plants have a capacity of 50 tons per ten hours, and their original cost is about \$60,000.

Peat has other uses than for fuel. When dried the upper layer serves as a bedding for horses and cattle in some parts of Europe, and in the same parts of the old country it is powdered and mixed with molasses and fed to cattle; but it is very doubtful as to beneficial results. The dark colored peat of the lower layers, mixed with barnyard manure, makes an excellent fertilizer. By the Ziegler system of briquetting, about ten pounds of acetate of lime are made from every ton of raw peat. Alcohol can be made from it by direct distillation, the process being similar to that of wood spirit. Properly ground and pulverized it makes a very desirable brown color for dyeing, which neither the sun nor atmosphere will bleach or decompose. Peat is a non-conductor, and, therefore, is valuable in the lining of ice houses, and for covering of pipes, and in partition walls. Good and cheap white paper is now made from bleached peat; and that which is most fibrous is found to be an excellent material for manufacturing pasteboard and felt. At Hamburg, Germany, artificial stone is made from peat for street pavements, in lieu of asphalt; and in that city there is a firm which produces leather from it for the soles of shoes. In the coking of peat, by one process, 90 pounds of tar are produced from every ton of raw material. Powdered peat is a cheap, effective and odorless disinfectant for rooms, closets and stables. It exhausts by sucking nine times its own weight, and its use in Europe is becoming more popular every year to effect a healthy and refreshing air in buildings. For preventing epidemic diseases it is spread in hospitals, the sick room and slaughter houses.

For country people a small \$400 plant for compressing cold peat will be found to answer almost every purpose. These presses are on sale in New York City, where there is an experimental plant for determining the heating quality of peat from any place, and where they have facilities for measuring the depth and volume of peat bogs, and for pressing the product. With our peat beds developed in every part of Pennsylvania, we will have an abundant supply of cheap fuel. So long as all goes well at our coal mines, and we have our timber lots, we think that other sources of fuel supply are quite unimportant. But within the year you will have practical illustrations in some parts of our Commonwealth of the better fuel in the form of peat briquettes. Thus we are gradually reaching a more comfortable condition in home life, with tenfold more opportunities and blessings than had our forefathers, and with tenfold more reason for gratitude and praise to Him "who giveth us all things to enjoy."

Mr. W. H. Stout, of Pinegrove, one of the Geologists of the Board, read his report, which is as follows:

REPORT OF THE GEOLOGIST. NO. 2.

BY W. H. STOUT, *Pinegrove, Pa.*

The subject of Geology has received but little attention in its relation to agriculture, being principally confined to investigations relating to minerals and metals. Recently the United States Department of Agriculture commenced a soil survey which may lead to valuable results in designating the various formations and their adaptability to different crops, besides giving more prominence to a much neglected study. The true basis of agriculture, the soil, being of first importance, of which Agricultural Geology deserves fully as much consideration as any of the sciences relating to art.

Also from a hygienic point the subject merits careful study, and the longer a community has occupied a locality the more are the dangers from contamination increased from surroundings, saturated with the waste and decay, finding its way into the water supply, resulting in disease. This fact emphasizes the necessity for a better knowledge of the trend and dip of the rock formation wherever wells and springs are used for household purposes.

This State contains a great variety of soils, from the Azoic or primary system up, embracing Alluvian and drift. The mountains in the State have a N. E.-S. W. course, and in traveling in any of the numerous valleys, the same formations continue long distances and practically contain the same characteristics; but in passing from the southern border to the line of New York the numerous formations are passed over with the rocks found at all angles to a horizontal position.

The classification adopted by the most distinguished Geologists are various and confusing to the layman or non-scientist. They give us the Paleontological, the United States system of Rogers; New York State; Ansted; Lyell; Mantel and Buckland; Dana and others. Those who read the Pennsylvania Geological reports have the same as adopted by New York State and are perhaps the most familiar to us.

Starting from the Delaware River and crossing Delaware county, we would have the alluvial or river mud, gravel and clay, trap, serpentine, Chestnut Hill schists, mica scists and gneiss; South Valley hill slate and the Laurentian Syenite and granite.

Next north comes Montgomery with much the same, and additional, the new red or Triassic and Limestone. Entering Lehigh we find, in addition, the Potsdam sandstone; Hudson river slate; Utica shale with Medina and Oneida of the Blue ridge, also the shaly limestone used in making cement.

Crossing to Carbon, the entire Devonian and Carboniferous systems occur, divided into the Clinton red shale; lower Helderburg Lime, Oriskany sandstone; Marcellus black shale; Hamilton, Gene-

see, Chemung, Catskill, Pocono sandstone, Mauch Chunk red shale, Pottsville conglomerate and the coal formation, besides the drift in places.

Lackawanna is a continuation of the same as Carben and Susquehanna, largely so excepting that much of the territory in these counties is drift-covered, and the rocks remaining almost horizontal over most of the sections outside of the coal measures and consist principally of the Catskill group, so that uneven and rolling, the northern tier and the glaciated district are more uniform over larger area than where the rock is tilted and the various strata appear near the surface and close together.

These characteristics cover much or all the surface of the State excepting in the bituminous coal districts where the mountain limestone occurs, which does not appear east of the Susquehanna River, but appears to have the Pottsville red in place of the limestone.

The principal distinctions between the various soils may be the Alluvian, the limestone, the old and new red, much alike in value, the shales, the traps, and the drift being more varied.

The coal measures, where the conglomerate and Pocono sandstone prevail, the soil is very poor generally and is said by Prof. Johnston, "to drink up all the water and eat up all the manure."

Some of the Oriskany sandstone and the Hamilton shale appears better adapted for road material than for agriculture, and also of the drift when composed of too much coarse material, gravel and stone.

The Delaware River gravel, where the finer sediment was deposited from the glaciated territory, contains some of the very best soil. The mica schists also, the limestone valleys are among the most desirable.

The clays vary greatly in productiveness, where drainage is good, naturally or artificially, with proper treatment, can be made to produce good crops of wheat, oats and timothy and sometimes fine corn during dry seasons.

The lake country, formed and shaped by glacial agencies back of the terminal moraine, is usually much more productive and adapted to cultivation than in the immediate vicinity south of the moraine where the mountains are more abrupt and the valleys narrow. It may be said that the mountains were removed to a great extent through glacial action, streams dammed up and watercourses changed in opposite directions from their former currents and all the lakes originated under the influence of moving ice, irresistably moving onward to an isothermal line where warmth checked its forward movement. Afterwards, probably climatic changes caused a recession of the ice field, moving back to where what exists of it to its present latitude near the Polar region. Agriculturally the soils from the various formations differ much, while some general principles apply to their treatment. Some of them are more retentive of moisture and fertility than others and have inherent elements which, through the agency of heat, moisture and carbonic acid, disintegrate readily and yield fresh supplies to successive crops, requiring less artificially supplied plant food than those of other origin.

The subject is one which could be continued almost indefinitely from different aspects and is worthy of more care than usually exercised by the farmers whose labors are almost daily directed to ob-

taining best returns from such soils as they possess and too frequently by misdirected efforts endeavor to obtain something from nothing.

Notwithstanding the great quantities of insoluble plant food in most soils, it is of little use to the present day farmer, and a misleading theory in science because available to the chemist with strong acids and intense heat. Vegetation possesses only to a very slight extent the power to obtain what is required from insoluble constituents present in the soil.

The soil which engages our attention as farmers is composed of an admixture of minerals, decayed vegetable matter, together with the remains of animal creation, in the surface soil of sand and clay in various proportions, during long periods of time when oceans swept over the present surface and again exposed to the elements, fitted conditions for plant and animal life.

That the amount of animal matter incorporated in time must be considerable, yielding phosphoric acid by perished animals on land and in seas, with that of prehistoric races which may have existed in the past, being again restored to the elements from which they were derived. That long, wiggling slender creature usually considered useful as bait for fishes and food for birds, has and continues to perform a great feat in digesting vegetable matter in our soils, besides adding its own remains, after working over tons of material in the ground, and it is well known that a soil abounding in angle worms is a sure indication of fertile ground.

On motion, duly seconded, the Report of the Mineralogist was received, and filed.

On motion, duly seconded, the reports of Col. H. C. Demming and Mr. W. H. Stout, Geologists, were received and filed.

Mr. Sexton, Chairman of the Committee appointed to call on the Governor, reported that the Committee had performed its duty, and that the Governor could not be present until this afternoon at half-past four.

Dr. Tower presented the Report of the Executive Committee which was accepted. (See page 8.)

The SECRETARY: Mr. Chairman, we have with us Mr. Cook, of New York, and I would suggest that he take the next period. I do not think a motion is necessary; if there is no objection, you might announce that that would be the order. We do not mean by this to cut out any of those other reports; they can come in a little later, we hope.

The following subject was discussed by Mr. Cook:

BARN CONSTRUCTION AND SANITATION.

BY H. E. COOK, *Denmark, N. Y.*

Mr. Chairman, and Gentlemen of the State Board: I want to say by way of introduction and preface, that this is the first oppor-

tunity I have had to meet the farmers of Pennsylvania, and I feel that indeed I have been honored by this Board in coming here for a time to discuss the subject of stable sanitation and construction. Not before in the history of dairying has there been so much interest in this subject. We have now reached a point where we can safely advise a certain style of construction that will give satisfactory results.

Again, as it concerns the health of our farm animals. I do not believe that we have spent time enough and given that side of the question enough consideration, for we all know that is a very important question, anything that will promote the health of our farm animals. We have spent a great deal of time trying to clean out tuberculosis, but I do not believe we will succeed until we give our animals more cleanly conditions. If there is a germ anywhere in this country, and it is turned loose in ninety per cent. of the stables in New York, that germ will develop and grow. Why? Because it is so dirty, unsanitary, in so many stables. I have been nearly laughed off the platform for making the statement, Mr. Chairman, that the place fit to produce milk for human food, ought to be a place clean enough in which to make bread for the household. It is true, yet people laugh at it. They say, what do you mean? Go down in the stable to make bread? Well, not in a good many of them, and yet, do you know, it would be safer for the human family to have the bread made in the stables just as we find them to-day, festooned as they are with cobwebs, and reeking with filth, than to drink milk made in such stables. Is that too strong a statement? I do not believe it is. The trouble is, our view-point has not been right. When we have talked about these cleanly conditions, and this intelligent effort to clean our stables, people have almost ridiculed the idea as though it was too trifling to be worthy of consideration.

This human food, we should remember, is growing more babies now than ever before, so that the conditions under which cow's milk is produced, are certainly of the greatest importance, and if we do not properly attend to them, we will have to suffer for it. We want to give more consideration to the production of milk, than any other single food that we produce.

Now let us see if we cannot carry on a system of construction that will be applicable anywhere, whether it is in the cold northern section of New York where I live, or whether it be here in this possibly more congenial climate, or anywhere that we keep cows; and I believe we are in a position to-day where we can do that, and I want to give a great deal of credit to Professor King, of Wisconsin for it. I am sure that it is not too much to say that Professor King has done for our animals—the health of our animals—as much as Dr. Babcock has done for the quality of our milk. I believe in giving a man credit when he does a thing, and not wait until he is dead before we tell him that we appreciate it.

GENERAL BEAVER: From the standpoint of the human family, and its interests, no doubt a question of great importance is involved, and I would like to inquire if you take that up in your lecture as a special feature.

MR. COOK: No, only indirectly. If the character of our milk is such as we ought to have, it must be produced under certain conditions of sanitation.

GENERAL BEAVER: I mean whether you treat as a special feature the effect of milk upon the human family in your lecture?

MR. COOK: No, sir. You have doctors and professional men who know all about these things, and I do not go into that because I find that within the limits of the time allotted, I have more than enough to talk about anyway without trespassing upon grounds with which I am not familiar.

I am not disposed to waste time in generalities at all and so I want to get to this subject. I am not here this morning to talk to you people, let that be understood at the outset. I want to talk with you. It makes a difference whether you are talking to a man or talking with him. If you are talking with him, he will do half the work, and that is very much easier than when you are talking to him for then he expects you will do it all. When I started out six years ago to work along these lines, I found that fifteen minutes or half an hour was a long time, but the subject has grown so big it takes a good deal longer time now and it has become rather a question of packing it into a little time. I spent an hour each day of last week working with the students of our State College along this line of barn construction and barn sanitation, which I believe is one of the most important questions that we have to deal with to-day, especially on our dairy farms, for several reasons: First, milk is one of the cheapest human foods that we have, and one of the best, a food that is almost entirely digested and a very important food that contributes to the means of living for so many men, and getting to be a great commercial proposition—the selling of milk.

From that point of view, I believe we ought to look seriously at the production side of it that we may make it possible for the people in the cities to get better milk, and cleaner milk, and in my judgment that will largely settle the question of price, and unless we have an understanding of the methods of barn construction and the principles that govern it, it has been my experience and observation that we do not reach the results we ought to have. A gentleman last winter asked me to go out with him to see how he could best put in a system of ventilation. When we walked into the barn—it was one of those older stables with a low ceiling—I took out my knife and went right up through the ceiling. I said, you don't need ventilation here, you have got so much ventilation now that if you could market this ventilation it would bring you more money than your milk product. I said when it is warm outdoors, it is warm in this barn, and when it is cold outdoors it is cold in here. He didn't have an idea of the first principles of ventilation. When we go into one of those barns—one of those old fellows where you can almost throw cats through by the tail—there is no use of bothering about ventilation. The first thing that man wants to do is to buy some lumber and paper and build over in a proper manner.

What we need to do in our cow stables, is to conserve the heat of the animal, and still give them pure air. Now how shall we get it? The further north you go the more necessary it will be to have, what

I call perfect insulation, that is, the surface of the walls inside of the barn so constructed that they will keep dry; in fact, the question really hinges upon that point of keeping our animals dry, because in a moist atmosphere there is always danger, and while you may or may not know the full bearing of this—I presume Dr. Armsby knows, and I wish I had the opportunity to ask him some questions along this line—but I may say to you that a cow weighing a thousand pounds will throw off from her lungs and her skin, about seven pounds of water every twenty-four hours. Now we want to build so that in the cold weather, that moisture won't condense on the side walls of the stable. Haven't some of you seen it there? Damp, side walls, wherever you have looked on every side, in the winter?

I bring to mind a man who, last winter, built a new barn, and he built it tight and close and stopped every crack and corner, yet he noticed this dampness of the walls, and he says, "I am sorry I put water in my barn;" he thought it came from the water supply, but it didn't, not at all, it came from the cows. If you have thirty cows in your barn, you have two hundred pounds of water every day that has to be lifted out of the building. Now if your side wall is cold, it is bound to condense there, and you want to prevent that, that is what we want, and the great question is, how to do it. There are several ways to do it. There is one way that I believe is the best way for ordinary buildings, viz: To ceil inside and outside of the studs or girths and fill the space with straw or dry shavings. They are inexpensive and most valuable insulating materials. Of course if you are building of concrete, you can do it effectively with little trouble. If you have two walls, we will say four inches thick, you leave eight inches of space, and this should be at the top and at the bottom, like this (indicating on blackboard diagram) that is dead air space and will serve to insulate the inside of the room, but it is almost a physical impossibility to build a dead air space with lumber unless you build for cold storage, and I don't believe it is necessary. Of course if you furrowed out here (indicating) and put on another, say here (indicating), and so on until you had three dead air spaces, it would serve the purpose. The trouble is right here; say that is the outside of the building (indicating) and this is the inside, with a single or double thickness of matched lumber on the outside wall, leaving a little crack right there (indicating) and another little opening down here in the bottom (indicating). In the winter time the cold air will get in here and start itself in motion, then the inside of the stable wall is cold.

Do not build the ceiling too high. Bring the ceiling down to at least eight or nine feet. If the stable is large it really needs about nine feet. It is of no use when you get up above seven or eight feet, there is no use in making it higher for the ordinary sized stable. Some of our New York builders are building larger and larger. I know of one stable built twenty feet high, and they actually had to put in another row of windows in order to float the moisture out of the room. Now you do not need that, so I say bring the ceiling down.

Now about light. Each cow should have at least four square feet of window space; that is not extravagant. More, rather than less. There is a difficulty in an excessive amount of window space if that heat very rapidly radiates out. Double windows should always be

provided, in fact, any stable like this would be compelled to put in double windows to prevent frosting in the more northerly latitudes. In my own case, we use a sliding door on the outside, and swinging door on the inside; in the summer time they can be taken off and put away.

A Member: In most of our Pennsylvania bank farms it is not possible to get that much window space on account of the bank.

MR. COOK: That may be; I am not familiar with your conditions in that respect. Another point, and that is, the location. We have got all these problems to deal with, but I find that by careful study of certain principles, we can usually work out the desired results. Of course I am speaking now more particularly to the man that is going to build new; but many of these things can be applied and we can adjust them to the location that we have. In building new, if it was possible I would have a stable located as near as I have indicated there perhaps to the north and south line, that is, I would have this exposure over here to the south or the southwest. I would prefer a south or southwest exposure if it is possible to get it. Of course it is not always possible, and where it is not, we have to do the best we can, but it is desirable for the reason that we get the largest amount of sunlight during the winter time through windows that have that exposure. I have a barn and it was fortunate that I could give it this exposure without any trouble at all, and from the early morning until late at night, the cows are really bathing in the sunshine. Now with almost any other exposure there would not be that advantage.

MR. HUTCHISON: Have you ever remodeled any of those barns like we have in Pennsylvania?

MR. COOK: No, I never was in Pennsylvania before.

A Member: Where there is a great deal of bank surface, you would have to set the windows on top with chutes up to them and up to the mow.

MR. COOK: What we want is the sunlight, because you know what effect that has on germ life.

A Member: Do you think it to be practicable to remodel bank barns?

MR. COOK: I think it would be pretty hard work to remodel them and to create the conditions that we would like to have.

PROF. SHAW: Do you think a southwestern exposure for the sake of admitting more light in the winter, is always desirable? Suppose you lived in a country where the prevailing winds blow from the southwest? Don't you lose a little in having your buildings face the southwest rather than the south or the southeast?

MR. COOK: I do not see that you do so far as the sunlight is concerned.

PROF. SHAW: No, but so far as the warmth is concerned?

MR. COOK: Well, if your building is properly insulated, I do not believe it will concern the temperature inside of your stable.

PROF. SHAW: Suppose you were to turn your cows out, as I understand you do, and you turn them out in one case in a yard that is protected from the wind and in the other case it is exposed a little bit to the wind, you work a little bit to a disadvantage there, don't you?

MR. COOK: I would not turn out milch cows on a day when the weather was not genial. I would rather have them on the inside than on the outside.

PROF. SHAW: The day might be genial but not quite free from wind if facing a southwest exposure.

MR. COOK: There might be a condition there that would have to be considered.

MR. HERR: In our bank barns that are closed up, wouldn't it be well to build a warm shed where cattle could stand part of the time on the inside, when they couldn't get out on the outside without being exposed to the wind or to the cold?

MR. COOK: The question of covering a barnyard where bedding is high priced and difficult to get, as it is in New York and New England, is an abomination because of the difficulty of keeping them clean. Where the question of bedding don't concern you, then it is worth your consideration. The covering of a barnyard where cows can be turned in, in conditions like those, and which we will have perhaps during the greater portion of the day in the winter, may be desirable. If this is done, they should be put into the stable for feeding and for milking.

MR. HUTCHISON: Did I understand you to say that you don't have any bank barns in New York State?

MR. COOK: No, I didn't say that. We don't have a barn in New York built as I indicated here. (Referring to a sketch made on blackboard.) I don't know of any such barn in New York where there is a projection.

I would like to ask how many men here are using cement in their stable construction?

A Member: A good many.

MR. COOK: With us a good many keep animals directly on the concrete. I would like to ask if you have any trouble; I would like to know what the sentiment is here.

A Member: I prefer to keep cows on a plank floor rather than on a cement floor.

MR. COOK: That is perhaps because the floor is cold and often slippery, but that usually comes from men who built the floors a dozen years ago, but it is principally because of the fact that they are cold, that they are objected to, and they are cold, there is no mistake about that. Concrete is a good conductor of heat, but I feel to-day

that we can get around that so easily and so cheaply, that we ought not for a moment to consider the use of plank over concrete because the plank will soon wear and soak up the liquid, and the planks are objectionably dirty, and I do not believe that we ought to consider them as fit material for use. I think that we ought to get every last trace of a board or any sort of lumber stuff out of our stables that we can. I don't know whether you are going to take kindly to that, or not, but so far as my opinion is concerned, that is what I believe.

I want to show you just a moment in one of our barns what we are doing, where we are not even using mangers. A person may say, I don't like that, and that the old fashioned manger is good enough for them, the old fashioned manger which came up about three feet high and one of the most difficult things in the world to clean. And what are the results. Why, they don't clean them, that is all. If they are feeding silage, the boards get sticky, and that is a splendid place to develop all kinds of germ life, and I am against the proposition. Now if you want a manger, here is one that it seems to me—I have not drawn it very artistically—but perhaps after I name it you can tell what it is, in fact, that is the floor line, and this is a representation of the side of the barn, and here is the manger. Now the manger ought to have just a little inclination toward the passage way or walk, inclined just a little; remember this is a sectional view. Right in front of your manger put in just a little depression, not very much, perhaps an inch, then it gives an opportunity for the water to run off. This floor slants slightly towards this little depression, and this of course will be carried the whole length of the stable. Now that is the manger. That could be changed a little in form. Don't build this over eighteen inches from that point on the floor line. There is much to commend in using a cement manger on the score of cleanliness, and as meeting sanitary conditions.

(Mr. Cook made a diagram upon the blackboard showing the form of a stanchion which he recommended, and made an explanation in regard to same that would not be intelligible without the diagram with proper references to the various parts of its construction.)

A Member: I would like to inquire what would be the cost of these stanchions where you are putting up, say, fifteen or twenty?

MR. COOK: Including the pipe and everything?

A Member: Yes.

MR. COOK: It will cost about five dollars.

A Member: Per cow?

MR. COOK: Yes, which will include, what it seems to me is the best construction, which will be by putting in a piece of pipe of the same size anchored in the cement at this point and coupled here with an L making it a little less than three feet to that point shown by that line. (Indicating on board.)

A Member: How far apart?

MR. COOK: That will depend on your cows, of course; large cows three or four feet, small cows less. If you take these dimensions, I think you will find that will give about the best form; there is a little danger of their feet getting in here.

Now to come to the question of dampness, in a building, in a room where the temperature is low, there will be more or less moisture. I spent two or three days with one of the best concrete engineers that I know so as to be sure about my position, and this is what they are doing. Now let that represent the concrete foundation. (Indicating on blackboard.) Of course that may be of gravel or crushed stone, or it may be of the little field stone. All my concrete work has been built of little small stone about the size of my fist, and then they are filled in with sand and cement. Where you can get them, they are the cheapest; it is the cheapest way to build the foundation. After that work is done, then they proceed to put on the top paper. First, before that is put on, the surface is covered over with tar paper. (I can show that better here.) We will just coat this over with tar paint, and then we will cover that with a single sheet of tar paper and then we will coat that over again, and so on until we have got three thicknesses of tar paper thoroughly cemented on, then go on and put on your finishing coat. The only thing that I think it necessary to advise is, let that finishing coat be a little thicker.

A Member: Don't that scale off?

MR. COOK: No; I think it is fairly safe to say that that may be from an inch and a half to three inches. Take this portion of the barn here where it is only used for a walk, and mangers, or a passage, it is not necessary to have it thick, but in this portion back here, if you draw out your manure with a pair of horses, that is probably the hardest strain that comes on the concrete. Of course, where the union is formed it is not necessary to have it as thick as that. Three inches above the paper will do. It ought to be at least three inches thick where the strain is heavy.

We want to finish it up with a straight edge, and while there are different methods of giving this rough, sandpaper finish, one is to sprinkle on some sand and cement after it has just set a little. Another way is to take a broom and go over it, but it seems to me that they are crude compared to going over it with a board trowel, and that will work up that sandpaper finish which makes the floor as safe for an animal to walk on as plank; the coarser the sand, the better. It ought to be coarse, sharp, clean sand; the nearer it meets these conditions the better will be the surface finish.

A Member: Do you want that board rough or smooth?

MR. COOK: I have always used a smooth board. It gets rough, of course, in a few minutes.

A Member: Does that exclude the moisture?

MR. COOK: Yes, I understand it does; men tell me it does.

After the experience I have had with concrete for six years, I would not let a man come there and put in plank under any consideration.

A Member: I had to go and put down planks for my brood sows; I lost some because I didn't do it sooner.

MR. COOK: You were certainly right, sir, with an animal, a sheep or a brood sow—they must not lie on cold concrete; but where that is covered with dry straw, there is a perfectly safe proposition, and our sows have raised their pigs and gone through the winter. And I would like to tell you, if I had time, the method we used in that building for successful and easy cleaning.

A Member: Couldn't you use an inch or so of soil right on top of that concrete?

MR. COOK: Yes; but it would not be so good as the straw, of course.

Adjourned to half-past one o'clock this afternoon.

Harrisburg, Thursday, 1.30 P. M., January 25, 1906.

The meeting was called to order at the designated hour with Mr. S. M. McHenry in the Chair.

Reports of Specialists and Standing Committees, continued.

COL. WOODWARD: Mr. Chairman, I was requested by Mr. McGowan to express to the Board his great regret that he cannot be here this afternoon, and to say to the Board that the cause of his absence was the sudden death of his nephew.

The SECRETARY: He left his report with me and it can be read, or filed and printed.

On motion, duly seconded, it was agreed that the report of Mr. McGowan on fertilizers be filed and printed, which is as follows:

REPORT OF COMMITTEE ON FERTILIZERS.

BY HOWARD G. MCGOWAN, *Chairman*.

The use of Commercial Fertilizer upon the farms in Pennsylvania continues to be forging ahead with no halting whatever, which seems to say, if you want increased crops, you must use Commercial Fertilizer.

Although Commercial Fertilizer can be made to supply the elements that are wanting in the soil, the use of barnyard manure that has been thoroughly fermented will supply all that may be required by plants.

The point in selecting fertilizers is to procure those brands that assist to make the barnyard manure more complete. Barnyard manure is very rich in nitrogenous materials.

“Rich food makes rich manure.” Farmers want to make more of

a study of the value of the food as a fertilizer for the land, after it is fed to the animal. While our farmers are devoting and spending hard cash for fertilizers, there are countries that pay more attention (and advisedly so) to the value of the food given to animals as a fertilizer for the land. Cotton seed meal, gluten meal, bran and many other products should be fed with an eye open to the fertility that they contain for the enriching of the land.

A recent bulletin estimated that five-eighths of the plant food in the manure of farm animals is contained in the liquids. A large part of this liquid is lost through the barnyard on many farms. The annual value of the manure of one cow is about \$19.00, hence five-eighths of \$19.00 or \$12.00 can easily be lost by many farmers if the greatest care is not observed.

In Germany premiums are offered for the best systems of taking care of farm manure. The Pennsylvania farmers would do well and reap a much larger profit from their farms if they would be more painstaking with the farm manure as a fertilizer.

Though no correct estimate of the value of farmyard manure can be made, yet the following is an approximate value arrived at: The value from cotton seed meal is about \$28.00 per ton, linseed meal, \$20.00, beans \$16.00, bran \$12.00, clover hay \$10.00, timothy hay \$4.84, corn meal \$7.00, straw \$3.00, and so on.

The value of manures, however, depends not only upon the food, but also upon the condition of the animal that makes it and the fluctuation of the market. Just as soon as farmers can be induced to experiment on their farms more, if only on a few small plots, they will become converts to the many advantages in using Commercial Fertilizers in forcing the land to give larger crops. We are now learning that a greater value is contained in an insoluble Rock Fertilizer than we were led to believe years ago. The preference is given an insoluble phosphate that can be dissolved but slowly in the soil, through the agency of the weak vegetable acids, but which will accomplish the desired results if the farmer can afford to wait two or three years for the return of his investment. Farmers, nevertheless, require soluble and immediately available plant foods if they wish to realize in the shortest period of time and derive fair profits. Insoluble or soluble, which is what we ask from our learned men.

The output or sales of fertilizers by the manufacturers in the State has been larger than for any previous year. Farmers are using more fertilizing per acre on their farms or on their various crops and find it pays them to do so. In Pennsylvania, it is said, almost five millions were spent for fertilizers the last year. Some use as much as one ton per acre. To show how rapidly, comparatively speaking, the fertilizer sales are increasing, we can judge by noting the following output in the little country of Australia since 1897. In 1897, 3,000 tons were used; in 1898, 12,500 tons; in 1899, 16,500 tons; in 1900, 24,600 tons; in 1901, 31,400 tons; in 1902, 37,500 tons; in 1903, 44,500 tons; in 1904, 52,000 tons and in 1905, 56,000 tons. This shows a constant gain in the use of fertilizers, more than double in five years. Pennsylvania shows a like increase.

A fertilizer has two values, its commercial and agricultural value. Its commercial value is determined by the market value of its constituents and the cost of the labor required in preparing it for the farmers' use. The agricultural value of a fertilizer is the increase

in quality and quantity it will produce in the crop to which it is applied.

Germany claims to have increased their crop production sevenfold by the use of fertilizers. The fertilizer market has taken on a tone of increased activity. Japan is becoming a good market for new fertilizer materials and other countries are following suit.

The proper application of any kind of fertilizer to the soil largely depends on the previous crop, the kind of crop desired the next season, an even distribution of the fertilizer over the surface, while some experience may be of assistance in using fertilizer as well as in preparing it. Land rich in potash is not particularly benefitted by an application of that element and the same may be stated of phosphatic and nitrogeous materials. It is needless to say that commercial fertilizers, to be complete, must contain three elements, ammonia (or nitrogen), phosphoric acid and potash.

We believe, taking our State over, that the tendency is towards using complete fertilizer.

We are familiar with a farmers organization that orders large quantities in the spring of the year of a complete fertilizer, the analysis of which was ammonia 3, acid 7, potash 12. With very little modification this formula is used with good results throughout the whole season.

Every dollar put into fertilizer and used on the farm is equivalent to making deposits in bank for the future, while the investment will be safe at all times.

The farmer who has a large heap of manure is the one who should purchase fertilizer, as the combination cannot be surpassed. There are some users of fertilizers who frequently want to know from what source the different elements in a fertilizer are derived. For instance, a fertilizer contains 3 per cent. ammonia. The idea is that the manufacturer should state upon the bag or sack from what source the ammonia is drawn, whether from nitrate of soda, blood, tankage leather scraps or whatever else. Likewise with the phosphoric acid and potash, whether the acid is derived from animal bone or from S. C. rock, or whether the potash is derived from muriate, sulphate or kainit, and so on. This by our State law is not required at present. Whether it would be better for the consumers' best interests to know or have this information given as above set forth is an open question. The farmer needs, however, all the light and protection that can be thrown around him in respect to the proper purchase of fertilizer for results.

Year after year, farmers are using commercial fertilizer more intelligently. The farmers' institutes are proving a great factor in educating the farmers along these lines, and the many bulletins sent out by the Experimental Stations are giving to the farmer a vast amount of valuable information along the lines of using fertilizers.

The Department of Agriculture by its special agents being sent out over the State to collect fertilizer samples under the direction of our Honorable Secretary of Agriculture, N. B. Critchfield, is doing a valuable work collecting these samples, which samples are subsequently analyzed by the chemist. The results of such analyzation being published and sent out broadcast over the State is doing a vast amount of good for the farmers.

No one need be in ignorance as to the proper use of commercial

fertilizers. Every farmer can know when he buys a ton, and know just as well what he is doing, as the man who knows when he buys a suit of clothes, or any other commodity on the market. Farmers post yourselves about the judicious use of fertilizers. Study analysis. No study will pay any better. The land is the farmers' bank, and when the land is enriched through the judicious use of commercial fertilizer his bank account will be increased, from which or by which he makes himself a business man of greater use and influence in the community wherein he resides.

He who makes two blades of grass grow where only one grew before, is a public benefactor.

The CHAIRMAN: Our next number on the program is the Report of the Meteorologist, E. R. Demain, Harrisburg, Pa.

Mr. Demain not being present, his report was passed.

The CHAIRMAN: That brings us down to our regular afternoon session, and the first number on the program is the Report of the Committee on Floriculture, Edwin Lonsdale, Chairman, of Girard College, Philadelphia, Pa.

DEPUTY SECRETARY MARTIN: Mr. Secretary, I handed you his written report, and we received a letter from Mr. Lonsdale stating that he could not be here owing to certain business reasons; that report is in your hands.

The SECRETARY: That report can be read or printed as the other reports were.

MR. SEXTON: Mr. Chairman, I move that the report be received, placed on file and printed.

Motion being seconded, it was agreed to:

The following is the report:

REPORT OF COMMITTEE ON FLORICULTURE.

BY EDWIN LONSDALE, *Chairman.*

Information comes from every direction that the business in flowers and plants has been the best ever known, especially does this statement apply to the amount of trade done at Christmas time. And owing to the excellent weather conditions during the Fall and early Winter, the flowers produced were of the very best quality, and the prices realized were a little better than usual. This applies to the better class of both flowers and plants.

The demand for plants in bloom for Christmas gifts is still on the increase, and the weather being all that could be desired at the time for delivery, such trade is most satisfactory.

Cyclamen plants in bloom are among the favorites for Winter. The flowers vary from pure white, through various shades of pink and crimson; some of the white varieties have a crimson eye. They make

an excellent plant for the house, but do best in a room not too warm, say as low as 45 degrees at night. In a window in a room on the north side of the house I have known individual flowers to last in good shape for six weeks. This plant, like all others for home adornment, must never be allowed to become dry. It is the safest way to water them at least once a day. There are more plants killed by neglect in watering than all other causes combined.

Azalea plants in bloom also continue to be popular. The colored varieties, as red or pink and mottled for Christmas, and the white ones for Easter.

For the Christmas holidays the Poinsettia continues to be the most popular plant grown for its brilliant red bracts (surrounding the flower), being so bright and cheerful. Botanically it is now classified with Euphorbia. Euphorbia Poinsettia is the name now given, but to the gardener and flower grower it will ever be called the "Poinsettia." This is a native of Mexico. It is very accommodating and lends itself to more than one method of treatment. It may be grown on stems from three to six feet long, crowned with a cluster of its bright red "leaves" on top; or by putting cuttings or slips in the propagating bed in July and August plants from six inches to a foot high may be had in bloom for Christmas. The tall ones are generally used for cutting and the latter as pot plants.

Another flowering plant similar in character, also blooming at Christmas, is what is known among the fraternity as Euphorbia Jaquinuæflora, but now the botanists pronounced that name to be wrong and should be *fulgens*, not such a formidable looking name assuredly and much easier pronounced, but the old florist and gardeners will continue to call it by the first name given for many years to come. The flowers of the Euphorbia just referred to are much smaller, but more numerous than the Poinsettia, and are studded quite thickly along the gracefully arching branches, and have a dash of yellow in their coloring which gives them a brilliant orange tint approaching scarlet.

The brilliant shades of red in the Chinese Primrose are as popular as ever. It is easily grown from seed and is a satisfactory flowering plant for the windows in the cool rooms of the house, but the temperature of said room should never be allowed to go below 45 degrees.

Palms are always in demand. The "Rubber Plant" (*Ficus elastica*) is not as popular as it was a few years ago, though still one of the very best plants for the house.

The so-called Boston Fern increases in popularity. It is so easily grown and gives such general satisfaction that its present popularity is well earned. By selection and cultivation quite a number of varieties may now be had of this fern. The one called *Scottii* still holds its own, being a dwarf and of a more compact form of growth than the older variety. There are some with the fronds, of much larger proportions than the "Boston," being very much divided, resembling somewhat an ostrich plume. This is called *Elegantissima*. The other new varieties are similar to the last named, but each varies somewhat in some one particular. A competition has been arranged to take place at Horticultural Hall, Broad Street, Philadelphia, during the Chrysanthemum Show next November, where all the varieties of the Boston Fern (*Nephrolepis exaltata*) may be brought together so that the judges may pass upon them and say which they

believe to be the best. Every one of them are satisfactory as house plants, so that what the judges agree upon will not decide which is the only one to grow.

Plants with berries, as the *Ardisia Crenulata*, are very popular, so also are what is commonly known as the Jerusalem Cherry, which is not a cherry at all nor anything near to it, but is a *solanum* (*Solanum capsicastrum*), which belongs to the egg plant, peppers, tomato, and potato family, but is used only for ornamental purposes, its orange colored fruits being quite attractive to look upon. These plants are readily raised from seed and grow to a fair sized plant in one season. Each fruit contain a number of seeds, so that it may be raised inexpensively.

Orange plants in fruit are also grown in quantity in pots for Christmas. This species grown is known in catalogues and encyclopedias as the Otaheite Orange. Its habit of growth is dwarf and bushy. The flowers are fragrant and the fruit is edible, but the flavor is not of the best.

The *Aucuba Japonica* is a plant very attractive when its plentiful and oval-shaped berries are red and ripe. This plant is imported from Europe generally already with the fruit fully developed. Botanically it belongs to the dioecious class of plants, which means that some plants have pistilate flowers while others have staminate flowers, the former bearing the berries. In order to cause them to form their attractive berries, the pollen from the staminate flowers must be applied to those with pistilate flowers. In this connection the European nurserymen refuse to accept orders for only the pistilate variety, so as to keep the trade in this particular class of plants all to themselves. This can be overcome, of course, by retaining a plant and sowing the seeds as soon as ripe, and in the natural order of events in due course the young plants resulting therefrom will, when sufficiently mature to flower, be found having both forms in less or more equal numbers, but to do this takes time, and as this plant in Pennsylvania, unless in very favored localities, is not quite hardy, it will be necessary to give the plants greenhouse protection. Until the sex, so to speak, of each plant becomes known it would be quite expensive, and in these strenuous days and the desire to become rich quick, commercial men hesitate to undertake it, feeling the uncertainty of the undertaking for immediate profits, but farther south of Pennsylvania or possibly in some favored spots in this great State, it would undoubtedly prove to be profitable when grown outdoors.

In many parts of Great Britain the Holly—native to that country—with its bright red berries, is more symbolical of Christmas than any other one thing. No matter how poor the family, a few sprigs of Holly in fruit will surely be seen in the windows at that season. The English Holly (*Ilex ovalifolium*) from a decorative viewpoint is superior to our native Holly (*Ilex opaca*), being a much more rich green in color, contrasting with marked effect with the red berries.

I referred to this Holly in last year's report. I want to emphasize what I said then with as much force as possible, urging some young man to begin experimenting as soon as possible, for this Holly is slow in growth and for a time disappointments must be looked for. Our Commissioner of Forestry would be a great help in this matter. He could tell us where the best prospects for a success in experimenting could be made. The European Holly needs rich, moist land, where

the frost is not too severe, on a north hillside where the sun would not be likely to shine upon them in the winter time, early in the day, when the trees were frozen, would be the most likely place I would think to make the experiment, and the north side of a hill it is natural to suppose would be more moist than would be the case on the south side, less evaporation going on in that situation. But about the richness of the soil I don't know. Hillsides, as a rule, are not considered very rich in plant foods, on account of the wash naturally taking place during heavy rains.

This Holly is sub-dioecious, so that it would be necessary to have some of the staminate varieties in every plantation. It would be best to secure seedlings from a reliable nurseryman in Europe, and it is reasonably sure that plants with both characters would be among them. There have been described over one hundred and fifty distinct varieties in English horticultural publications, some varieties having flowers with both pistils and stamens. Varieties with beautiful variegated foliage are among them and are very ornamental in the climate of the older country, retaining the variegation all through the seasons. During the past holiday season I saw two hundred beautiful specimens that had been imported. They were uniformly pyramidal in shape and very full of berries, and sold at four dollars each. The native species, *Ilex opaca*, though not so valuable for decorative purposes, is very useful on account of its evergreen character and its bright red berries. It also has the advantage of growing satisfactorily in very poor soil. It is also much hardier, enduring colder weather with less injury than its foreign relative.

Among flowers, there is very little new to report. The American Beauty Rose still holds its own against all comers, but the red Rose Liberty has a very formidable rival in the new Richmond. The latter may be a trifle lighter in color than the older variety, but the casual observer cannot tell the difference, and it has the great advantage to the producer of flowers of being a variety that is far easier to grow, and consequently to bloom more freely. This, of course, is what has to be looked out for, for no matter how beautiful and desirable a flower may be, if it cannot be grown to produce flowers in sufficient quantity to be profitable, it of necessity must be dropped.

New carnations continue to be produced, proving to be both desirable and valuable. According to the daily newspapers, a new variety has recently changed hands for an amount said to be \$40,000. This is said to be an improvement on the celebrated "Mrs. Thomas W. Lawson." It is known by the high sounding name "Aristocrat."

Among scarlet carnations,—and this is a very desirable color, more especially at Christmas,—there are two new varieties of that color, the respective owners of which are striving for supremacy. These are the "Robert Craig" and "Victory," both of which are meritorious varieties. Unbiased judges are inclined to the belief that the former is the better flower, but the latter is the freer bloomer. May the good work go on.

MR. KAHLER: Mr. Chairman, the Committee on Legislation is now ready to report.

The CHAIRMAN: If there are no objections, we will hear the report of the Chairman of the Committee on Legislation.

Mr. Kahler, the Chairman of the Committee on Legislation, presented and read the report of the Committee, which was as follows:

REPORT OF THE COMMITTEE ON LEGISLATION.

Mr. President and Gentlemen of the Board:

At the meeting of the State Board of Agriculture in 1905, in which there were quite a number of bills formulated by the Joint Committee of all the Allied Organizations pertaining to agriculture; namely, Stock Breeding, Butter Association, Poultry Association and all other kindred associations. A number of said bills were approved and presented by your Committee at the last session of the Legislature. Your Committee is sorry to report that a very small per cent. of said bills received favorable consideration and were enacted into law, and in this report we wish to show our appreciation by thanking the Members of the Legislature and the Governor of the Commonwealth for his approval and to any and all who have contributed towards the passage of the following bills:

The Appropriation Bill to pay the expenses of the Board attending the Annual Meeting.

For the small amendment to the General Road Bill, whereby the counties and townships are relieved of one-sixth of the expense imposed by the original bill, and making it one-eighth.

Some improvement to the Local Road Bills, allowing the townships to elect three supervisors and to appoint path-masters and allowing the townships to vote as to whether they work out or pay money for tax

An appropriation to enable us to stamp out the Scale of this State.

We would suggest an Amendment to the Township Road Bill, wherein it provides that the State pay 15 per cent., where the township vote to pay tax in cash, we would insert to word 40 per cent.

But we deplore the action of the Legislature in not allowing trolley cars to carry freight. While we favor the trolley system and are willing to make some sacrifices, we think that we are entitled to more benefits than we can derive merely from passenger traffic. And we also recommend to the Legislature that hereafter we are emphatically opposed to trolley systems occupying our public roads. The using of public roads endangers the public travel and makes travel hazardous, and greatly interferes with the proper improvement of our public roads. We think that we are entitled under the circumstances to have the trolley lines carry our freight to and from the market.

We recommend a further amendment to the General Road Bill; that the words "county and township" be eliminated from the original bill and the Road Commissioner to have entire jurisdiction under the bill to proceed without the consent of the County Commissioners and County Supervisors, which, in our judgment, only complicates and hinders the working of the bill and would relieve local taxation to that extent and place the costs upon the State where it justly belongs. We would further recommend the enactment of a law whereby the personal taxes and the license fees should be retained

in the counties in which they are assessed, thereby relieving our overburdened taxation. We further recommend an increased appropriation for our township high schools, thereby assisting our rural districts to maintain a Centralized High School System.

While it is recognized that agriculture is the seat of all prosperity of our country, we do recommend that the Legislature make a larger appropriation toward carrying on the Farmers' Institute work. We therefore recommend that \$50,000 should be appropriated instead of \$35,000.

All of which is respectfully submitted.

Signed by the Committee,

A. J. KAHLER.
M. N. CLARK,
JASON SEXTON.

On motion, duly seconded, it was ordered that the report be received and placed on file.

The CHAIRMAN: We will now hear the report of Prof. Menges on Entomology.

Prof. Franklin Menges, of York, Pa., presented and read his Report on Entomology, as follows:

REPORT OF THE ENTOMOLOGIST.

BY PROF. FRANKLIN MENGES, *York, Pa.*

The Entomologist of this honorable body would respectfully submit the following as a suggestive report:

The San Jose Scale still occupies the center of the stage in insect depredations and keeps the Entomologist of the State Department of Agriculture and his assistants busy giving demonstrations for its extermination, arousing fruit growers and farmers to realize the imminent danger in which this insect places their industry.

We suggest that this body give the Department the fullest cooperation, and assist in this final effort so that we may soon be privileged to say, "Well done, good and faithful servant," and sing the requiem, peace to the ashes of the San José Scale.

While doing Farmers' Institute work at Fort Littleton, Fulton county, Mr. D. W. Froker showed me corn stalks infested with what seemed to be the Corn Stalk Borer. These larva bored about in the pith of the corn stalk, and while they did not kill the stalk, they weakened it to such an extent that no ears were produced. We would suggest that this insect be thoroughly investigated.

Another insect, which is by no means new, the Bronze Birch Borer, seems to be becoming more numerous in the northern part of the State; and as the English Sparrow seems to be driving out the natural enemy of the Borer, as well as that of a large number of others—the Woodpecker—it increases in numbers and is now destroying the White Birches in many localities. This I have only from hearsay and not from personal knowledge.

A NEW DEPARTMENT.

By an act of the Legislature of 1905, the new Department of Health of the State of Pennsylvania was created. This Department is under the direction of Dr. Samuel C. Dixon. Dr. Dixon has a local representative in every county, town and city in the State, whose duties are to prevent the spread of contagious and infectious diseases. We think this Board should lend its influence to this new Department, and to Dr. Dixon, in its effort to frustrate and stamp out these diseases in this State, especially because the spread of these diseases is often directly or indirectly traceable to the farm, and if not so traceable, the farm is usually blamed for the infection and contagion.

Insects play no small part in this infection because they can either act as mechanical carriers of these germs, or as an intermediate host, or a necessary element in the life cycle of the disease germ.

One of the commonest and most frequent is the carrying of typhoid fever germs by flies. The bacilli, which are found in the excreta about the premises where typhoid fever has prevailed, adhere to the feet of the flies and are carried in the next flight to a dish of food allowed to remain exposed in the culinary department of the house, or a milk pail, or even to the dinner table. By means of the food, the germ will gain entrance with the elementary canal often with disastrous results. This has been fully demonstrated in the army camps of the Spanish American war. But typhoid bacilli are not the only ones transported in this way, but well nigh conclusive evidence is on hand that the germs of Cholera, Erysipelas, Tuberculosis and Bubonic Plague have been carried in this way. Neither are flies the only carriers, but other blood sucking insects, such as mosquitos, bed-bugs, flees, etc.

Not only do these insects carry disease germs by adherence to the external parts of their bodies, but experiments have shown that various bacilli may pass unharmed through the intestine of the fly and be recovered in the ejections of these insects. This is not only true of bacilli but eggs of such parasites as the tape and round worms, have been found unaltered in the droppings of flies. I have already intimated that insects are frequently an intermediate host or a necessary element in the life cycle of disease germs. Thus the embryonic round worm in the human blood must be drawn into the stomach of the mosquito, wander out into the thoracic muscles and grow to a definite stage of development before they can again enter the human host and become sexually mature adults which produce the blood inhabiting embryos.

In case of Malaria, the germ must be drawn up into the stomach of the anopheles mosquito and within its body undergo a complicated series of changes before the new generation is ready to be injected into the human blood, where they produce a new case of Malaria. The biting insect is not only an essential, but it is equally necessary that the organism pass through the changes in the mosquito before it can infect. This has possibly been more clearly shown last summer in the Yellow Fever Epidemic at New Orleans. It was shown that a specific type of mosquito (*Stegomyia fasciata*) designated often as the Yellow Fever Mosquito, transmits this disease. This mosquito acquires this power by feeding on the blood of a Yellow Fever

patient, but can infect or introduce the disease only after a lapse of ten or twelve days. Before this time the bite of this infected mosquito is harmless, therefore, it seems only reasonable to conclude that the organism passes through certain stages necessary in its development to reach the condition in which it is able to re-enter the human frame and infect susceptible persons. During the prevalence of Yellow Fever at New Orleans last summer, Dr. Dixon, the State Health Officer, had, through the Entomologists of the Academy of Natural Sciences an investigation made of fruit vessels coming into the harbor of Philadelphia, for Yellow Fever infested mosquitoes.

Frequently epidemics break out in isolated rural communities for which there is no apparent cause, and for which the local physician cannot discover any definite reason. Such cases should be referred to the Health Department, the cause identified and the remedy applied. We all know that about the farm, building conditions exist which breed enormous numbers of unnecessary flies and mosquitoes. Rational hygiene demands the removal of these conditions and the extermination of flies and mosquitoes as well as any other biting insects. We would, therefore, suggest that this Board assist the Health Department in its efforts to induce the farmer to create such hygienic conditions about his premises that infection and contagion of his own family cannot take place on his farm, nor of any of those who use his products, for if it is worth while fighting the San José Scale, it is certainly worth while creating healthy conditions about the barn and destroy breeding places for insects.

It was moved and seconded that the report be received, placed on file and printed. Agreed to.

The CHAIRMAN: We will now take up the Report of the Committee on Forestry, Mr. Irvin C. Williams, Chairman.

Mr. Williams presented and read his report as follows:

REPORT OF THE COMMITTEE ON FORESTRY.

BY I. C. WILLIAMS, ESQ., *Deputy Commissioner of Forestry, Chairman.*

Forestry in this Commonwealth is advancing by slow but sure strides. It is a rule of the Department that the work shall proceed no faster than public opinion will commend. For this reason a slow and steady growth, sure of its ground as it advances, is preferable, with no sudden innovation or unusual and spectacular effort.

The business of forest protection, preservation, and restoration in Pennsylvania is purely a business, dictated by the laws governing good business policy. The Commonwealth has committed herself to this work and from it there can be and ought to be no retreat. The necessity for forest preservation is as urgent as ever, with the added idea that it is a necessity becoming more accentuated year by year.

It is foreign to the purpose of this report to dwell much upon the increasing scarcity of timber. This is a fact heretofore so frequently reported and so well driven home that it may pass as having been accepted by all persons who are at all familiar with the subject. The ideas intended to be conveyed relate to forest protection and forest restoration, with some added incidents, it being well understood that the reasons therefor are not dictated by sentiment alone but by that sound business policy already mentioned.

Since the rendering of the last report to your body, the purchase of wild lands for forestry purposes has been going on steadily. Not much is heard about it in the public prints, but the accretions to the forest reserves have grown so that the State will have within its control in a little while an aggregate area of about three-quarters of a million acres. These are to be set apart and devoted to the purposes for which the science of forestry stands in this Commonwealth.

The lands at present owned lie in twenty-three different counties. The larger bodies include about 56,000 acres in Pike and Monroe counties; 43,000 acres in Franklin and Adams counties; 250,000 in the central counties of the State, the remainder being scattered throughout the remaining counties. By far the larger part of the present holdings lies within the watershed of the Susquehanna River. Those in the northeastern corner drain into the Delaware, while only a small portion of those in the southern part of the State drain into the valley of the Potomac.

The same problem which confronted the administration of the forest reserves one year ago is still before it. This is the proper protection of the lands. It is gratifying to note, however, that the losses from fire are decreasing, and the report for the year 1905 is much better than for the preceding years. In the South Mountain reservation no fire occurred worthy of mention. Throughout the central reserves there were a number of small fires mostly set by the railroads. By far the most destructive occurred in Pike and Monroe counties. The evidence at hand seems to point to the fact that these were either willful or malicious fires.

There is a class of citizens in this State living near the wild unseated lands which has been trained to believe, from long immunity, that it is privileged to help itself to whatsoever may be found on such land. This is nothing less than larceny; but long habit and freedom from molestation have taught them to feel that this is a right of which they ought not to be deprived. The Commonwealth, of course, prohibits and tries to prevent all such acts, and while some timber stealing is going on, it is lessening in amount. Prosecutions followed by convictions with suitable penalties imposed and collected, have been the means of teaching a long needed salutary lesson.

By law the State is limited to the price of \$5.00 per acre in the purchase of lands for reservation purposes. It is probable that the average price paid has not been much in excess of \$2.00 per acre. The State has therefore nearly a million and a half dollars invested in forest reserves, which in due season will return an annual revenue greater than any rate of interest ordinarily paid in business circles for money invested. The difference between the business of forestry and any other business requiring capital is one of time only. From

the latter returns are made at comparatively short periods while from the former they are received only after the expiration of a longer period of time. In addition to the money revenue, the State and its citizens will be the better off for the protection and augmentation of its water supply, the better regulation of stream flow, the furnishing right at home of large quantities of necessary wood products, in addition to affording a field for unskilled labor to those who live in the small settlements nearby.

Upon these forest reservations are found the head waters of numerous streams breaking forth in springs at times of great volume. This water, running down the declivities of the mountain side, if properly controlled and utilized, would be the means of furnishing to the industrial communities of the State an untold number of thousands of horse-power, either directly from the fall of the water or through the medium of electricity generated at suitable stations and conveyed where needed through proper conducting cables. And the fact further remains that one stream is not only capable of furnishing power from a single plant, but that plants may be duplicated throughout its course and the water used over and over again in its passage from the higher to the lower level; and be it further noted that in thus utilizing the fall of the water it is in no wise contaminated or made unfit for personal or animal use. We confidently look forward to the time when such use may be made of the streams and small rivers which are wholly upon State holdings; for in these cases neither riparian or any other vested rights will be interfered with or even encroached upon.

The problem of pure water for domestic use is becoming one of greater moment every year. The phenomenal growth of manufacturing industries, naturally located near the streams, the increase of population about such centres and the use of the water courses for drainage purposes, all combined, make the problem of pure water supply frequently one not easy of solution. To enable incorporated municipalities to supply their citizens from a source not subject to contamination, and where a copious flow can at all times be had, the Legislature of 1905 passed an act whereby the Forestry Commissioner and the Reservation Commission may, under such restrictions and regulations as they shall deem to be for the best interests of the public, grant to municipal corporations the right to take and use water from the streams upon the State forest reservations. A few of the municipalities in the State are at this time considering the advantages of this law. No doubt others will, from time to time, be compelled to look in this direction.

The same Legislature, feeling that the withdrawal of the State forest reserves from taxation was in many instances working a hardship upon townships thinly settled and having little seated land, passed an act whereby the State is required to pay those townships five cents per acre for each acre of forest reserve so held, apportioned between the school authorities on the one hand at three cents per acre and the road authorities on the other at two cents per acre. It is no doubt just that the State should help to bear the burden in all communities where it enjoys these holdings. The amount needed for road construction is not decreased but the purchase of reserves continues to withdraw further areas from taxation. The amount required for school purposes by reason of increased population is

increasing. To withdraw the reserves from taxation is simply to compel the remaining owners of lands to bear the whole burden. Whether the arbitrary amount of five cents per acre, apportioned as above, is just to the State and to the other districts, is one open to discussion. It is the thought of many that the State lands should not escape without contributing their share, but that this share ought not to be more than the lands formerly paid when in the hands of private owners.

A class of legislation especially valuable to farmers and those owning large areas of timber land, is that which allows a rebate of taxes for maintaining the lands with a forest cover. Why our agriculturists are so slow to take advantage of these laws is a fact not explainable. While it may be attributed to lack of information on their part that there is such a privilege accorded them, it is true that some persons in some of the counties have taken advantage of or are about to take advantage of this legislation, and a more general interest on the part of those who know of these laws would surely bring them to the notice of others who may not be familiar with their provisions. The difficulty seems to be not so much with the people unacquainted with the legislation as with the officers whom they elect to carry on the public business of their counties, and who refuse to allow these privileges by taking refuge behind some obscure idea of unconstitutional legislation. They compel those seeking these benefits to resort to legal action in order to procure the rights and privileges plainly indicated in the body of the law, and upon which successive Legislatures of this State have been only too glad to set the stamp of their approval. A notable point in question is cited in a letter recently received by the Commissioner of Forestry from a prominent citizen in one of the richest agricultural counties in the State. It reads as follows:

"I have about 65 acres of timber and sprout land that is better than the law requires, and did have the assessor, as required by law, to go through the timber. After having the assessor see the timber, I went to the Commissioners and they could say nothing before seeing their counsel. On going there the third time they sent me to the collector and he said he is unable to do anything in that line before seeing the Commissioners. Upon seeing them they told him to notify me to pay all of my tax on the timber of which I claim a portion according to law. As I am the next to heaviest taxpayer in ——— township, I do not want to pay more than required by law. There are ten acres of the timber heavy enough to cut, twenty acres over eight inches, and forty-seven sprout cut in 1896. Now I would like to know who shall pay the rebate and what shall be done next?"

Is it any wonder that men who are engrossed with the details of their business, or who do not have time or money to conduct lawsuits to compel negligent or indifferent officials to do their duty, would rather submit to such treatment than be harassed otherwise, as it seems pretty certain they would be? Until the servants of the people learn that those who give them office expect them to do their full duty, and then proceed to do it, we may expect just such treatment as the kind shown. A principle of this government is, that the people rule and if those intrusted with authority are unwilling to

obey the will of the people, they ought to be summarily ejected from the offices they so dishonorably fill, or else of very shame resign of their own volition.

When the Commonwealth was young and it became necessary to offer inducements to settlers to take up lands, no fault could be found with the law which fixed the price at twenty-six and two-third cents per acre for vacant land. But after the State was well settled and lands everywhere therein had greatly appreciated in value, it was little less than absurd to dispose of the State holdings at that price. The fact that the Forestry Department in buying back these same lands for reservation purposes was compelled to pay many times that amount was of itself sufficient reason for the passage of the act of March 28, 1905, providing that no other vacant lands shall be patented to an individual, unless the same be first submitted to the Forest Reservation Commission for it to determine whether or not said vacant land is suitable for forestry purposes; and if suitable, the Secretary of Internal Affairs is directed to convey to the Forestry Department without cost. If unsuited for this purpose, he shall sell the lands at such rate as may be determined by disinterested appraisement, thereby procuring for the State something near their real value.

In carrying on the forestry work for the best interests of the Commonwealth, and of course that means so as to produce for the State the best revenue and best results in other directions, it is necessary to have carefully selected and well trained men to whose charge the work may be intrusted. Since forestry is as truly a science as any other science, and needs special preparation to carry it on successfully, the Forest Academy at Mont Alto was established by the Legislature in 1903. At the present time 26 young men are pursuing their studies and looking forward to future employment upon the State reserves, as trained foresters. The course of instruction covers a period of three years and, in order to give you an intelligent idea of the studies therein pursued, the branches covered by the work of the fall term, concluding with the Christmas holidays of 1905, were arithmetic, geometry, dendrology, botany, physics, bookkeeping, surveying, physical geography, German, chemistry, forestry, forest practice, forest accounts, cavalry and infantry drill. The students are selected by a competitive mental and physical examination. Only those are eligible to appointment who make a general average in this examination of at least 75 per cent., and no more than ten are appointed each year, unless there be vacancies. The number that we can accommodate at the academy is thirty, and the endeavor is to keep the classes filled to the limit. The academy at present is in charge of four instructors, and the first class of young men who are expected to be ready for real forestal work upon the reservations will leave in September, 1906. The academy is but little more than two years old, but it is working satisfactorily and has before it the promise of great future usefulness.

The forest reservations, held by the State in trust for the people, are the people's property, bought and paid for with their money, and it is proper that they should be accorded reasonable privileges thereon which do not conflict with the real purposes of forest preservation. To this end the Department invites the citizens of the Commonwealth to visit these reserves and camp upon them, to fish in their streams and to hunt over their hills and mountains, to en-

joy them to the full as great wild, free, camping and outing grounds, where men and women, and children as well, may find health and recreation. All this is done, however, subject to reasonable rules which the Commission has formulated for the government of the reserves. These rules are as follows:

RULES FOR THE GOVERNMENT OF THE STATE FOREST RESERVATION LANDS.

(Adopted by Resolution of the State Forestry Reservation Commission, September 1, 1905.)

1. The game, fish, and forest laws of the State must not be violated.
2. Birds' nests must not be destroyed or in any other manner interfered with.
3. Open camp fires or other fires must not be made, except in a hole or pit one foot deep, encircling the pit so made by the earth taken out.
4. Every camp fire or other open fire must be absolutely extinguished before the last member of the party using it leaves the locality.
5. Lighted matches, cigars, cigarettes, or hot ashes from pipes must not be thrown upon the ground. In every case they must be allowed to burn out or be otherwise extinguished.
6. Living trees must not be cut down or injured in any manner. Dead and down timber may be used for camp fires.
7. No person will be permitted to erect a camp who has not accepted in writing the camping rules and received a camping permit. When requested, every camping party, before selecting a camp site or pitching a camp, must report to a forest officer on the Reservation, who will assign a suitable camp site within the region where it is desired to locate. No camping party shall consist of more than ten persons at one time. Permits will be granted for a period of two weeks only, but may be extended upon further application.
8. Every person receiving a camping permit must report to the Commissioner of Forestry at Harrisburg, any violation of law or of the rules for the government of the State Forest Reservation Lands coming under his observation.
9. No permanent camp or other permanent structure may be erected on the Reservation.
10. The pre-emption of any ground as a special camp site to the exclusion of others who may desire to camp near, and who have permission to camp on State Forest Reservation Lands, will not be permitted.
11. All persons who desire to picnic upon the State Forest Reservation Lands, remaining for a less time than a day, and not over night, are not regarded as campers and will not be required to procure a camping permit, but will be governed in all other respects by these rules.
12. During the open deer season in each year, no dog of any description shall be used for hunting purposes on the State Forest

Reservation Lands, nor shall any such dog during that period be taken by hunters into camps on said lands.

13. The making of fires by hunters who stand on deer or other "runways" is forbidden.

14. The placing of advertisements on the State Forest Reservation Lands is prohibited.

15. Superintendents, wardens, detectives and all other Reservation employes are required to remove immediately from State Forest Reservation Lands all persons who take deer running dogs thereon, and to kill the dogs when found in pursuit of deer. They are also required to remove therefrom all persons who do not properly guard their camp or other fires so as to prevent destruction of State property by the starting of general forest fires, and campers who do not have proper camping permits.

16. All persons who desire to camp upon the State Forest Reservation Lands must first apply to the Commissioner of Forestry. A blank application containing the rules for the government of campers will be forwarded to the applicant, who must sign and return the same to the Commissioner. If in proper form, in the absence of other objections, a permit will then be granted.

17. All grazing of horses, cattle, sheep, and hogs upon the State Forest Reservation Lands is prohibited, except under direction of the Commissioner of Forestry.

TAKE NOTICE THAT

Persons who violate the laws or any of the above rules will subject themselves to immediate arrest without warrant, to be dealt with according to law; and may be denied all future privileges of camping, hunting or fishing on the State Forest Reservation Lands.

All State Forest Reservation employes, without first procuring a warrant, are vested by act of Assembly with power to arrest on view all persons detected by them in the act of trespassing upon forest or timber lands within the Commonwealth, under such circumstances as to warrant the reasonable suspicion that such persons have committed, are committing, or are about to commit some offense against any of the laws now enacted or hereafter to be enacted for the protection of forest and timber lands. They are likewise vested with similar powers of arrest in the case of offenses against these Rules, or for offenses committed against the laws for the protection of the fish and game found within the State Forest Reservations.

All constables are requested, in case fire occurs within their townships, to notify the constables of adjacent townships toward which the fire is traveling.

COMMISSIONER OF FORESTRY.

In addition to affording pleasant recreation grounds for those who are in the enjoyment of fair health, it becomes indeed more important that they should furnish a safe retreat to those who are suffering from what is known as the white man's plague, tuberculosis. A suitable location on the forest reservation removed miles and miles from the ordinary habitations of man, where pure, clean air carries healing to the diseased lungs, and pure, cold water refreshes

the feverish tongue, is the ideal place for the establishment of sanatoria for the treatment of incipient tuberculosis. The Camp Sanatorium on the South Mountain is ideally located. It is not a menace to any man, and the patients therein find healing and comfort. The State can do no better humanitarian act than provide liberally for those unfortunates who must of necessity withdraw from the class of workers. Here, at little expense they are provided for, healed, and restored to their friends and families, ready again to take their place in the producing class. The Camp Sanatorium, since its establishment in January, 1903, has treated about 120 cases, and the results obtained from its meagre equipment and small capacity have been most marvelous. The ready support of the Legislature for a continuance of this work will produce results hitherto wholly unsuspected.

We must keep before us, however, the primary object of the forest reserves, providing new sources of lumber supply; affording a cover to lands unfit for anything else than tree growing; and preserving and regulating stream flow. The whole work can and will have an effect for good upon all the citizens of the State, especially when combined with its incidental features, that of furnishing health and recreation to thousands of people. Those who realize the good which can thus be accomplished should, and we believe will, accord the whole movement the support which it so well deserves.

MR. SCHWARZ: Mr. Chairman, I would like to ask Mr. Williams whether he can give any information as to how to start a black walnut grove.

MR. WILLIAMS: Mr. Chairman, in answer to the gentleman, I would state that in Clinton county in the fall of 1904, five hundred acres of ground was plowed up—all of this lies in a swale or low place in a marsh—after the ground was suitably prepared and whatever debris was on the ground, was burned on the ground, then these walnuts were planted at short distances apart in rows. The nuts themselves were put in the ground, and allowed to remain there without any further attention whatever. In the spring of 1905, a large number of those walnuts have sprouted and are coming up, and giving every promise of making splendid trees. Possibly sixty per cent. of those planted were in that condition last spring. The walnut is a slow growing tree, and does not always sprout the first Spring after being put into the ground. The coming Spring we will look for a great many more that did not appear last Spring. I think we may probably count upon about eighty per cent. of those walnuts growing. In order to keep down the wild vine and bracken last summer at the proper season, the ground was sowed with buckwheat. The buckwheat grew so rapidly in that rich forest soil, that it simply crowded out the weeds which would have intruded. At this time the ground is almost bare of weeds, and it may not be necessary to give another sowing of buckwheat. Some of those walnuts are about thirty inches high, and are doing well, so far as I can tell, this being simply an experiment, and an endeavor to find out what the Department can do in this direction. We have great hope that this experiment may be successful.

On motion, duly seconded, it was ordered that the report be received, placed on file and printed

MR. SCHWARZ: Mr. Chairman, I would like to ask the distance apart that the Department expects those walnut trees to grow.

MR. WILLIAMS: At first, until they reach a size large enough to shade the ground, we will probably let them grow at distances of three feet apart; then as the size of the tree increases, we will take out each second tree; that will make it about six feet. If we find that is satisfactory for producing proper timber, they will be allowed to remain; if not satisfactory, another tree will be taken out which will produce distances of about ten to twelve feet.

The CHAIRMAN: Our next report is by the Committee on Cereals and Cereal Crops, Mr. I. A. Eschbach, Milton, Pa.

Mr. Eschbach presented and read the report of the Committee as follows:

REPORT ON CEREALS AND CEREAL CROPS.

BY I. A. ESCHBACH, *Chairman.*

In entering upon a report of the Cereals and Cereal Crops of Pennsylvania, I deem it but appropriate to mention a few developments along the lines of agriculture in a general way. To persons unacquainted with Pennsylvania, they are liable to underrate her position and rank as an agricultural State. The fact that she stands first among the states of the Union in the production of iron and coal and second in the value of her manufactured products, naturally leads to the conclusion that but little attention is given to agriculture. Instead of this being true, the thrift of the Pennsylvania farmer is proverbial, and the extent and variety of the crops grown in the Keystone State, gives her a very high rank as an agricultural State. The soil of all the counties west of the mountain ranges is of excellent quality, producing fine crops of grass for pasturage and hay, as well as large yields of the chief cereal crops grown in this latitude. The extreme northwestern part of the State possesses special advantages as a fruit-growing section. The leading farm industry in the northern tier of counties are dairying and stock-raising. The southeast section of the State or southern counties of the eastern border possess a climate adapted to the production of all the cereal crops and the immense milk-supply to meet the wants of the great city of Philadelphia, gives the milk dairy a very prominent place among the farmers of this section, and some of the finest equipped dairies to be found in America are located here.

As was said before, in the variety of crops grown in Pennsylvania, she stands prominent as one of the greatest in the Union in agricultural wealth, considering the area under cultivation. The handling of these cereal crops of Pennsylvania could not be accomplished under the old style of operation less than 50 years ago. Well does the writer recall a few back-breaking operations, such as using the sickle in some lodged rye, and swinging the cradle (not so comfortable a one as our dear mothers provided for their babes)

but one that required all the muscle the young man could muster up, to swing and lay on swath the crops of wheat, rye, oats and buckwheat produced. Farmers to-day have become mechanics, and the more machinery we can use profitably the better the work, and the cheaper cereal crops can be raised. We have to-day the self-binder to harvest the large crops of wheat, oats, rye, buckwheat and clover seed, and we have the corn-harvester to cut and bind that heaviest of all crops. The corn and the corn husker is fast coming to the aid of the farmers in handling this immense cereal crop. Commercial fertilizers have also figured in aiding the farmers of the State to better crops, and better grades and more fertilizers are being used each year in raising most of the cereal crops of Pennsylvania. The farmers of Pennsylvania are recognizing the fact too, that increased yields per acre, is the profitable way to raise crops. Men of minds in the great cities are looking to the farms of our country for the wherewith to feed the millions of humanity who are flocking to the great business centers.

Agriculture lies deep at the foundation of things that relate to the material life of the world and its vast processes go forward like the movements of the heavenly constellations in silence.

The year of 1905 has been unprecedented in the amount produced in this great country of ours according to figures shown by report of Secretary Wilson. This country has never known such averages per acre, as we have had, and we all feel that the limit is not yet reached. The possibilities of an acre are yet unknown. The past season of 1905 will go down in history as one of prosperity to the farmers, and improvements along all lines, in farm buildings and labor-saving appliances are apparent.

CORN.

By correspondence, observation and reports as could be obtained, we have ascertained that the corn crop of the past year has been a record-breaker, surpassing the great crop of 1903, in which the average production per acre was 31.2 bushels, while the crop of 1905 exceeds that year over 11,000,000 bushels, and the average production according to report of Bureau of Statistics is shown to be 38.9 bushels, a yield exceeded only in Indiana and Illinois. Some crops are reported as having an average of 100 bushels shelled corn per acre, but we somewhat discredit such reports, but crops of 60 to 70 bushels are to be found. The value of the corn crop can hardly be estimated. The green corn used for feed; the thousands of tons siloed each year; the millions of bushels husked and cribbed to be fed out and converted into beef, pork and mutton and the amount of corn-stover for roughage, place this crop ahead of all the cereal crops of Pennsylvania for food value. The benefits to be derived from the breeding corn for seed is being tested among some of our progressive farmers, and we feel assured that good results will be shown, where properly carried out. I also call attention to quite an income some of our farmers have from the sale of dried or evaporated sweet corn, as well as sweet corn sold in ear near our larger towns and cities. It is in itself quite an industry and pays well for time and labor expended.

WHEAT.

The wheat crop of Pennsylvania was one of the largest ever known. While no exceptional yields are reported, the average yield was ahead of former years. The highest yield reported is 36 bushels per acre and the highest average yield 27 bushels per acre. From reports, I ascertain that the average for the State to be 17.1 bushels per acre, being higher than for many years. The wheat in our locality (that in the middle eastern section) developed a most perfect berry, and good average yields, so that while the prices have dropped about 20 cents per bushel from a year ago, farmers still have a good return from their wheat crop.

OATS.

The oats crop, being largely a weather crop, gave promise early in the growing season of an abundant yield, but heavy storms about the time of heading and filling in our section lodged it so that the yield was less when threshing time came, than was anticipated. While many crops averaged 50 bushels or more per acre, other crops only threshed 20 to 25 bushels. This crop is a good crop for us farmers to raise, as it fits in between a corn and a wheat crop, and being a crop that is quick in growth and can be placed on the market in about 90 days from time of sowing, is a profitable crop for the farmer to realize on. Commercial fertilizers are used to good advantage on the oats crop, increasing the yield of straw, as well as improving the quality of berry and give weight to the same. The average the past year was 36 bushels per acre or 8 bushels in excess of 1903.

RYE.

Rye is a somewhat neglected crop in Pennsylvania and should be given a more conspicuous place among the cereals on light lands. On bluffs and land of thin quality profitable crops can be grown. Rye will do well where wheat will not produce paying crops. The amount of straw produced by growing rye in excess of what wheat will produce, would amply repay the difference in the price per bushel, being in our section about 15 cents less for rye than for wheat, and rye straw is in great demand in our towns at almost fabulous prices. The feed value of the rye crop is worthy of consideration and will add to the money-makers on our Pennsylvania farms. The average last year was 17 bushels, worth 65 cents per bushel or \$3,826,-228 in the State.

BUCKWHEAT.

Buckwheat is also grown to some extent in our State, and proves to be a very profitable crop as it only occupies the land for a few months and fully covers the entire surface during the time it is growing. It proves to be valuable to keep land clean and ready to put in a crop of rye and thus keeps the land fully occupied on new land just cleared and on light gravelly soils it is a money-maker and the crop the past year was sold from the thresher in our section at 50 to 60 cents per bushel. The yield varies from 30 to 60 bushels per acre. The average yield in the State was 20 bushels. Total yield, 4,647,960 bushels, worth \$2,602,858.

CLOVER AND TIMOTHY SEEDS.

But our report would seem incomplete if we omit the seeds. Clover seed and timothy also figure in making up a grand total and

adding to the income of the Pennsylvania farmer. The past season was not so favorable to the filling of the clover seed, but prices have fully made up for the less yield. Reports from our farmers are light yields, from one to four bushels per acre of good seed, and prices from \$7.00 to \$9.00 per bushel according to grade. It is worth the while for the Pennsylvania farmer to look after the growth of the clover plant for the money consideration as well as raising more clover for the purpose of improving our soils. We call attention to these seeds as being money-makers and also to raise rather than buy all our own seeds.

In the growing of the cereals of Pennsylvania, the farmer should have his eye turned to the grass crop as it is shown that the hay crop was worth as much as all the cereal crops combined. The hay crop for last year foots up almost fifty-five million dollars in this State. It is a money-maker, and in our rotation of crops, will find a place.

The outlook of the winter grain is at present rather favorable, but as no snow has yet covered it, the remainder of the winter may be more severe. The wheat crop was put in under good conditions, and the rather early sowing shows some depredations of the Hessian Fly. Sowing began in our middle eastern section about the 25th of August, and the earlier seeding has made quite a growth, while the Sowing began in our middle eastern section about 25th of August, and the earlier seeding has made quite a growth, while the later seeding suffered more from dry weather in the month of November. Altogether it has a favorable outlook.

The average crops of the past season have been good, in some cases, exceptionally good, and while prices have depreciated some from a year ago, we still have abundant reason to be thankful to the Great Giver of all good, that he has so abundantly blessed us in this grand old Keystone State. The fact that all cereal crops have shown such a decided increase over the years past, the question naturally suggests itself, What are the reasons?

First. We have had ideal weather conditions.

Second. Farmers are farming more intelligently, they have studied their business and the farmers' institutes, as they are being held are largely responsible for these great results, and should be encouraged in every way possible.

On motion, duly seconded, it was ordered that the report be received, filed and printed.

The CHAIRMAN: Our next on the program is on the subject of the "Care and Handling of Farm Animals," by Dr. E. E. Tower, Hop Bottom, Pa.

Dr. Tower presented his paper which is as follows:

CARE AND HANDLING OF FARM ANIMALS.

BY DR. E. E. TOWER, *Hop Bottom, Pa.*

I come before you at this time to take the part of one of the most important branches of agriculture and one, in my opinion, most neglected, namely: The Care and Handling of Farm Animals.

In our State of Pennsylvania, we have invested something over one hundred and fifty millions of dollars in live stock. Now if by some means we can increase the value of each animal to the amount of one dollar, or occasionally save the life or usefulness of an animal, the gain would be no small amount. This can be done, and in a majority of cases far more, and by a little closer observation of the so-called little things in everyday life. It is the little things to which I wish to call the attention of my fellow Institute Workers at this time.

I am aware of the fact that you all, like myself, have your specialties, and that no one man can be a specialist in all branches; but there are a few little things that can be thrown in incidentally that may be the means of saving the life of a valuable animal.

First, I will take the dairy. The common disease known as "Milk Fever," a disease that a few years ago was considered incurable and only an occasional cow recovered that had the disease. To-day, nearly every case can be cured and without the aid of a Veterinarian. The treatment is simply to inject sterilized air into the udder. No medicine is used. The instrument for performing this simple operation can be bought for \$2.50, and no dairyman should be without one. It is quite common for the farmer to think there is no medicine in air or wind, and in some cases there is not. The air must be sterilized in this case to free it from germs and impurities. Figuratively speaking of "wind" as a medicine to which the farmer has too often been made a victim, it must be thoroughly sterilized to free it from foggism and whims.

In the treatment of milk fever, as above stated, there should be no medicine given, for in a majority of cases the animal is unable to swallow, and should medicine be given it would be quite liable to enter the lungs and produce a pneumonia from which the animal may die.

A few years ago we were told of a disease called "Hollow Horn" and the horns were bored with a gimlet, and salt, pepper, vinegar and various other ingredients were inserted into the horns. The tail was also split and the same applications made in the incision and the animal was then supposed to be cured. To-day there is a marked tendency to de-horn cattle and we do not hear so much about the disease and it is now known that all cattle are liable to have hollow horns.

A few days ago a young man, who is a graduate of our State College, called me up on the 'phone and said that he had a valuable cow that had lost her "cud" and asked me what he should do for her. I explained to the young man that it was no more of a disease to have a cow loose her quid than it would be for a man to accidentally loose his. If this had occurred fifty years ago we would not have thought it strange; but at this enlightened age of the world it seems strange that a young man could graduate from the dairy department of our State College without being enlightened on subjects of this kind.

The subject of tuberculosis is one which is sure to come up at nearly every Institute, and while this is a deep subject and one which would necessarily be referred to a specialist, there are some things which you can all say to the anxious farmer who fears that he may have this dreaded disease in his herd.

A disease so varied in its attacks must have a very great variety of symptoms; but you can safely say to the farmer that any symptoms of decline in flesh, shrinkage of milk, cough or any other symptoms out of the ordinary, while the animal continues to eat well may be regarded as suspicious and the animal exhibiting such symptoms should be taken away from the rest of the herd until a correct diagnosis can be made. If this plan could be carried out, a great many of our valuable animals could be saved, for if animals affected with tuberculosis are permitted to remain with other animals it is certain to spread and it is in this way that infection becomes so extensive in some of our herds.

The farmer should be cautious in buying recruits for his herd. It is estimated that eight out of every ten cases of infected herds from cattle that were supposed to be healthy when purchased and before any physical symptoms could be seen the herd had become extensively infected.

Among the chief influences governing the spread of tuberculosis in a herd are stable management and stable construction. Hence we can all see the necessity of keeping our stables well lighted and ventilated. It is a fact that a majority of our stables are not as well lighted as they should be. The value of light is determined by several specific facts, viz: First, it has a decided germicidal action; second, it increases the resistance of animals from attacks of tubercle bacilli, and third, it favors cleanliness.

It is a common sense matter of observation that dark, gloomy stables are invariably dirty while light and well ventilated stables are most always clean. It is a very poor farmer who will permit dirt where it can be seen, and in my experience, a farmer who has stables that are well lighted also enforces cleanliness. The two go hand in hand.

An ample supply of fresh air is desirable for three reasons: It has a depressing influence on germ life, it increases the resisting powers of the animal and dilutes atmospheric impurities, at the same time removing them. Where ventilation is bad, whatever impurities enter the air in a stable they are in a comparatively concentrated state and are therefore manifestly more dangerous than when segregated and dissolved by an abundant supply of fresh air that is in circulation by reason of a good system of ventilation.

The hygienic value of cleanliness in a stable cannot be overestimated for the reason that practical sanitary science is largely made up of cleanliness. Exercise is also essential to perfect health. It is a proven fact that the proper moderate use of any organ of the body maintains it in health and that disuse leads to atrophy. I am aware that some of our official publications and a few of our institute workers advise us not to exercise our cows. Common sense and the laws of Nature do not sustain the theory. Take for example the fish in the Mammoth Cave, Kentucky. They are blind. Originally these fish were possessed with normal eyes, as there remains a cicatrice of sufficient proportions to show their primal condition. For thousands of years they have had no opportunity of using their organs of vision and Nature has gradually eliminated that important function. This is also true of deep sea fish and deep sea life.

A great deal has been said about the tuberculin test and I regret

to say that some of our leading agricultural papers have discouraged its use in a herd, reasoning that it is not reliable and that it may give an animal tuberculosis if it did not already have the disease. As a matter of fact, tuberculin contains no germs either living or dead and the disease cannot therefore be produced in that way. While we do not claim the tuberculin test to be infallible, we do maintain that is the best method we know of, and if properly used there will be little trouble, if any.

There is another disease known as "Anthrax" which is of considerable importance to farmers from the fact that it is extremely contagious to both man and beast, and is almost invariably fatal. This disease usually occurs in cattle over two years of age and runs a very rapid course, causing death in a very few hours. The symptoms are a discharge of blood from the nose or mouth immediately before or soon after death. The contagion is from this discharge and the "Anthrax" germ lives in the soil for an indefinite length of time. Sunlight and drying will destroy the germ; but a temperature of forty degrees below zero has no effect on it. All animals dying with this disease should be burned on the ground where they died if possible, thus disinfecting the ground and at the same time destroying the body. The one important thing to remember is that the animal should not be skinned, as it is in this way that man may be infected, and also that the hide may cause the distribution of the disease. The farmer should therefore be instructed to burn all animals that die from any unknown cause, for by so doing serious outbreaks of some contagious disease may be prevented.

Another disease known as "Black Leg" is one which the farmer should know more about. This is a disease of young cattle usually occurring between the ages of six months to two years. Like Anthrax it runs a very rapid course. Death ensues in from twelve to twenty-four hours. The symptoms of this disease vary somewhat from those of Anthrax. There will be noticed a puffed appearance on the hip or shoulder and the animal will be lame in the quarter affected. If the hand is passed over the affected part it will be found that there is gas underneath the skin. If punctured where affected a dark bloody, frothy discharge ensues, and to a man not familiar with the disease, would apparently indicate a bruise. This germ also thrives in the soil, consequently all carcasses of animals dying from this disease should be burned on the spot if possible. Thus far we know of no treatment that is effective in these two diseases, "Black Leg" and "Anthrax." Our State Live Stock Sanitary Board prepares a vaccine which, if properly used, will prevent other cattle, that have been exposed, from taking the disease.

This is of great importance to the stock owner, and if our Institute lecturers will bear this in mind and use five minutes of the time in which they have been accustomed to inform the farmer how to use lime and buy commercial fertilizer, in explaining this disease, I think the time would be profitably spent.

Let us turn our attention for a few moments to the horse and see if there is not something that can be done to better his condition. There are a number of good stables in Pennsylvania; but there is not one but what could be made better, and by improving stables we add value to our horses. There can be no doubt that the proper ventilation of our stables has a marked influence in determining the health

and vigor of the animals confined therein. It should always be borne in mind that the breathing of pure air is absolutely necessary for the existence of both man and beast, and in proportion to the purity of the air in which the animal is stabled, will be found the greater or lesser vigor and health and the consequent working of all the organs of the body. The effect of several horses confined in a closed stable is to impoison the air, and yet, even at the present day, there are too many who carefully close every aperture by which a breath of fresh air can in no way gain admission. What of necessity must be the inevitable result? The breathing of every animal contaminates and vitiates the air, and when, in the course of the night, this foul and impure air passes again and again through the lungs, the blood cannot undergo its proper and natural change. The result is impaired digestion, the brain and nervous system will suffer and all the functions of the body will be more or less disturbed, and one need not be surprised at finding sore throat, inflamed lungs, diseased eyes, mange and perhaps glanders in cases where such conditions exist.

When disease begins to appear among the inhabitants of these unventilated stables, it is no wonder that it should spread. When influenza breaks out in the spring or autumn it is, in very many cases, easy to trace it to one of these pest stables, and, moreover, it is particularly fatal in such places. Horses stabled in small numbers, that are rationally treated, have it comparatively seldom, and usually in a mild form.

The temperature of a stable is an important consideration. It should not exceed 70 degrees F. in the summer season or fall below 40 degrees F. in the winter. The temperature can be readily ascertained by a thermometer which no establishment should be without. In some instances a horse is kept in a poorly ventilated stable, and stands in this unnatural vapor for eighteen or twenty hours and is then suddenly stripped of all his clothing, led into the open air and there kept for two hours or more when the temperature is from 15 to 20 degrees below that of the stable. Putting the inhumanity of this out of the question, does it not stand to reason that an animal thus unnaturally and absurdly treated is subjected to excellent opportunities for the contraction of catarrh, rheumatism and various other diseases? It is not generally known, but should be understood, that the return to a warm stable is as dangerous as the change from a heated atmosphere to a cold and biting air. It is the sudden change of temperature, whether from heat to cold or the opposite that causes the mischief and yearly destroys thousands of horses.

The matter of light in a stable has been referred to in connection with the dairy stable and will apply with equal force to the horse stable. A large majority of our stables are foul and unhealthy, and the foulness and unhealthiness is invariably caused by darkness; whereas, if stables were properly lighted, dirt and foul matter would be seen and their accumulation prevented. As it is, both in cities and in the country, darkness covers a multitude of sins, even in establishments that are well ordered otherwise.

There can be no doubt that many a good horse has been made totally blind by being kept in a dark gloomy stall. The eye is a delicate structure, and when an animal, kept in a dark place, is sud-

denly taken out into a bright light, an inflammation is produced which often ends in the loss of sight. In case of sickness great care should be taken to make the stable comfortable and pleasant. Give plenty of fresh air and avoid draughts. Give cool fresh water in small quantities and often.

It is a common practice in some stables, in case of distemper, to burn old leather or some other malodorous substance and compel the afflicted animal to inhale the smoke. This is exceedingly wrong and is productive of great harm. If you wish to test the virtues of such treatment, try it yourself. In place of the injurious smoke, take a pail of wheat bran, turn boiling water over it and allow the horse to inhale the steam or vapor which arises. You will soon find that he will not resist this as he naturally does the smoke.

If it is necessary to give medicine, great care should be taken in its administration. Never tie or pull a horse's head up or seize the tongue and pull it out to make an animal swallow, nor what is still worse, never pour medicine into a horse's nose, as by these methods the medicine is very apt to reach the lungs and produce serious results. Simply elevate the horse's nose slightly by placing the hand under his chin and administer a small amount at a time, allowing the animal time to swallow.

In the absence of a veterinary, never give medicine unless you know exactly what its actions and uses are. There are a great many good horses killed by giving over-doses and poisons by persons unaware of the ingredients of the medicine given.

I would strongly condemn the use of aconite for the purpose in which it is commonly used by the layman or non-professional. It is a fact that this drug kills ten horses where it cures one, and if it could be kept from the men who do their own doctoring, the lives of many horses would be saved annually.

It is quite common to see men collect around a horse that has been taken sick on the road, and in all sincerity and honesty suggest a remedy which the speaker thinks cured his horse. The owner of the suffering animal, agitated and anxious to save his horse, takes the advice so freely offered and obtains the medicine as soon as possible and gives it to the animal. Soon another bystander exclaims, "I do not think the horse is troubled with the colic," and after venting his opinion, suggests a different medicine which he thinks is a specific. This is also obtained and administered, and so it goes until the horse is filled with all the drugs that can be obtained and he either expires, having been killed by kindness, or else lives on in spite of the wholesale treatment, showing that his constitution is stronger than the combined drug store in his stomach.

A story is told of a boy who, while on his way to school, saw a man doctoring a sick horse. The boy halted and after looking on for a few minutes said, "Pap had a sick horse and he gave him a pint of turpentine." Nothing more was said, and the boy went on his way to the house of learning. On his return he stopped to see how the sick horse was getting on, and the man said to him, "My boy, you said your pa gave his horse a pint of turpentine. I gave mine a pint of turpentine and he died." The boy replied very coolly, "Pap's did too." This illustrates what is oftentimes done without forethought of what dire results may follow.

Kindness to farm animals is a subject which should be taught in

our schools and also in our homes. Standing before you as an advocate of the lower races, I declare—what I believe cannot be gainsaid—that just as soon and so far as we pour into all our schools the songs, poems and literature setting forth mercy and kindness to these dumb beasts, just so soon and so far shall we reach the roots, not only of cruelty, but of crime as well.

Mr. Angell in his address at New Orleans said: “We long ago found that the great remedy for all these wrongs lies, not in the laws and prosecuting officers, but in the public and private schools; that a thousand cases of cruelty can be prevented by kind words and humane education, for everyone that can be prevented by prosecution.”

How many know what kindness to a horse means? It means a better horse, a better owner or driver. It shows in a sleek glossy coat. It means a thrifty condition. It produces one-third more work with the same amount of feed. It creates a friendship and a mutual confidence which, in cases of accident or emergencies, has often been the means of saving human life.

It was moved and seconded that the report be received, placed on file and printed. Agreed to.

MR. HUTCHISON: Mr. Chairman, while Prof. Shaw is coming forward, I would like to make a motion. I move that a vote of thanks be returned to all these Specialists and others who have prepared and presented papers; also that a vote of thanks be returned by the Board to the Hon. James M. Shumaker, Superintendent of Public Grounds and Buildings, and for fixing up this room for us, and arranging it as a place of meeting.

The motion being seconded, it was agreed to unanimously.

The CHAIRMAN: We shall now have the pleasure of hearing from Prof. Thomas Shaw, of Minnesota, his subject being, “Feeding Farm Animals.”

PROF. SHAW: Mr. Chairman and Members of the Board of Agriculture and Ladies and Gentlemen: If I understood the last speaker right, he said that the value of live stock had declined somewhat during recent years. You remember, those of you who were here yesterday, that I made the statement that there was a direct relation between the amount of live stock kept on the farms of the country and a profit that may be derived from those farms, so that I hope, whatever may be the cause that produced such a statement, that those causes may be speedily removed. I was cheered, however, by the statement made by another speaker a short time previously. If I heard him correctly, he said that the hay crop in the State of Pennsylvania was its most valuable crop. There is a close relation, as you all know, between the growing of hay and the growing of live stock, as well as between the growing of grass and the growing of live stock. I do not think that that could be said of many states of this Union, that the hay crop is worth more in money value than any other crop of the State, and I take it, sir, as an augury for good; I take it as one of the most hopeful indications in regard to the future of this State, that such is the fact.

Now, according to the program, I was to talk to you about the subject of feeding animals on the farm. I have been in Pennsyl-

vania only about two days, and I am not going to tell you intelligent farmers in Pennsylvania how you ought to feed your stock, for you know better than I; but with your permission I will try to do this: I will try to talk about some of the principles that must be observed in feeding live stock, and if I give those principles correctly, it will lie with you farmers to take those principles and apply them in doing the work on your farms.

The following is Prof. Shaw's address:

FEEDING FARM ANIMALS.

BY THOMAS SHAW, *Professor of Animal Husbandry, University of Minnesota, St. Paul, Minn.*

The successful feeding of farm animals is never the result of accident. It is the outcome of giving food and care more or less in conformity with the leading principles that govern such work. The measure of the success will be the measure of the fidelity with which these principles have been observed. True, the individual who thus succeeds may not be able to formulate those principles, but he unconsciously follows them all the same, or success would not crown his efforts. In the absence of formulated principles, the individual must learn from the experience of some one else; in their presence he has a safe guide, in the absence of experience, although experience is necessary to enable him to apply them in the most successful manner.

The following are chief among the leading principles that govern the successful rearing and feeding of farm animals:

LEADING PRINCIPLES.

1. They must possess quality before they can be fed and reared with marked success.
2. More food is required to make a given gain as the birth period is receded from.
3. When periods of stagnation occur before maturity, the food of maintenance, fed during such periods, brings little or no return.
4. When development is seriously arrested at any period before its completion, the feeding quality of the animal is affected adversely.
5. When development is unduly forced by stimulating foods while the animal is young, its feeding qualities are injured.
6. In the fattening process, when animals are so ripened that they crave to make good gains, further feeding can only be done at a loss.
7. In selecting a ration for feeding, a due regard must be had to the chemical constituents of the food or foods which compose it.
8. In nearly all instances a mixed diet is superior to one composed of any one food.
9. In fattening animals the profit or loss resulting is largely influenced by the cost of the animals up to the time when the fattening begins.

10. Pregnant animals should be maintained in a good condition of flesh.

11. When animals are exposed to temperatures below what is normal, additional food, proportioned to the degree of the exposure, will be necessary to restore animal heat.

12. Discomfort from any sort arrests development, and consequently, produces loss in proportion to the degree and continuity of the same.

QUALITY IN FARM ANIMALS.

Quality when applied to farm animals is comprehensive or otherwise as the term is defined. More commonly it has reference to handling the skin and flesh, especially of cattle. When thus applied it has reference mainly to the sensation conveyed to the mind through the sense of touch. Its presence is usually sought by touching certain portions of the body with the finger-tips to ascertain the depth of the covering, and by grasping the skin over the ribs within the hand to ascertain its looseness and flexibility. A good depth of elastic flesh relatively over the portions that are more difficult to cover, as the loin and shoulder-blade, and loose pliant skin are indicative of good digestive qualities, as they are the outcome of these.

As used here, however, quality is used in a wider sense, that is to say in the sense of capacity for well-doing as indicated by the breeding and form in addition to the handling. The breeding of animals has of course an important influence on their feeding qualities. As a rule, well-chosen, pure bred animals of the beef breeds will make greater gains and more rapid gains from a given amount of food than will common stocks of mixed and inferior breeding, or than animals of the various dairy breeds. This statement has been denied, and some of the experiments conducted by the experiment stations would seem to favor such denial. Other experiments tend to sustain the opposite view. Of the correctness of the stand taken, however, I have not the shadow of a doubt. Good digestive and assimilative qualities are as much a matter of transmission as qualities or properties that relate to form.

The possession of correct form is, of course, immensely important. The precise nature of such form will be largely dependent on the precise object for which the animals are reared. In meat-making animals it usually means much relative width and depth, and fore and hind quarters well-balanced as to weight. In milk-giving animals it means much capacity of barrel and various other accompaniments which cannot be mentioned here.

The difference in capacity of animals similar in age, breeding and form, to digest and assimilate food, is very great. It varies in some instances between 50 and 100 per cent. One steer being fattened will sometimes gain but little more than one pound a day, whereas another steer will gain two pounds per day on practically the same food. But the difference in returns in meat-making animals as the result of form is no less great. One cattle beast possessed of correct form will sell for 5 cents per pound alive, when another fed for as long a period will only sell for three cents, the difference being based entirely, or almost entirely, on form.

COST INCREASES WITH ADVANCE IN AGE.

As a rule, the amount of food required to make a pound of gain in meat-making animals increases as the birth period is receded from, and increase in weight decreases continuously.

It is easily possible to make a cattle beast of beef inheritance gain two pounds daily during the first year not including birth weight, even though reared essentially on skim-milk and adjuncts during the milk period. The same animal is not likely to increase in weight the second year more rapidly than one and a half pounds per day, or the third year more rapidly than one and a quarter pounds per day, notwithstanding that more food was consumed the second year than the first, and the third year than the second. The explanation is found in the greater activity of the digestive organs near the birth period, and to the increase in the cost of the food of maintenance as the birth period is receded from. Young swine furnish an exception to the rule regarding increase in weight but not in regard to increase in the food required to make weight. Young swine while nursing cannot be made to gain so rapidly as at a later period.

The economy of pushing our meat-making animals rapidly from birth until ready for the block will be readily apparent. The importance of so doing increases with relative increase in the cost of food. It may be different where, at certain seasons of the year, cheap and coarse foods are abundant on the farm, and it is desired to utilize them to the utmost, or where pastures are partly or wholly free as on the range. It may be that a steer grown on the range will bring greatest profit sold at four years. It may be also that a steer grown on farms in the Mississippi basin, where, oftentimes, much fodder is wasted, will bring greatest profit at three years, but in the Eastern and New England states, greater profits will certainly come from selling steers finished at an age not exceeding two years, where food is relatively dear.

CESSATION IN GROWTH.

The truth must be self-evident, that if at anytime before development is completed growth ceases in whole or in part, the cost of the food of maintenance is proportionately increased. If cessation in growth is complete, there is no return for the food of maintenance during its continuance, unless it be under conditions where animals are thus carried on until they can be maintained on cheaper foods. For instance, it may pay a ranchman to carry an animal through the Winter without gain in order to bring it to that season when it will graze on pastures that cost but little or are entirely free. But it will not pay the eastern farmer thus to carry a young animal through the winter, since pastures on eastern farms are valuable as well as coarse foods.

The farmer who puts a young animal in winter-quarters at the advent of winter, and who turns the same out to graze, say five months hence, without any advance in weight, has virtually lost the food fed during those five months. The only return he has is a poor grade of fertilizer, the value of which will be largely offset by the labor expended in caring for the animal and the cost of providing suitable shelter. In growing meat-making animals, therefore, on eastern farms, the wisdom of keeping the animals growing all

the while and with prudent haste, and of selling them at a relatively early age will be abundantly apparent.

ARRESTED DEVELOPMENT.

Should development be arrested in whole or in part at anytime before it is completed, the capacity for future development is weakened and in proportion to the degree to which development was hindered.

When the hindrance to development is slight and covers but a short period, the injury resulting may be so slight as to be imperceptible, notwithstanding, time is lost in completing development and there is also a proportionate loss in the food of maintenance. If the arrested development has been prolonged and severe, in addition to a proportionate delay in completed development and a proportionate loss in the food of maintenance, there will also be a proportionate loss in the capacity for future development. Feed the animal ever so well, subsequently, and it will never wholly regain what has been lost. In other words, the same profit can never again be made from growing the animal that would otherwise have been possible. If the arrested development has been exceedingly severe, then the loss of capacity to develop may be so great as to preclude the possibility of making any profit from rearing the animal under any conditions however favorable. It should also be remembered that the loss of capacity for future development is greatest when arrested development occurs near the birth period, and gradually grows less as it is receded from. The importance, therefore, of keeping animals pushing on with a prudential haste from the day of birth until development is completed, or until they are ready for the block, cannot be easily overestimated.

Arrested development may arise, of course, from various sources. It may come from insufficient or unsuitable food, or food both insufficient and unsuitable, also from food excessive in supply and nutrition, or from under exposure, or from several of these, and it may be the other causes combined. It would be too much to claim that the source of arrested development did not influence the loss of capacity referred to, but it would not be claiming too much to say, that whatever the source, the loss in capacity to develop will be serious whenever prolonged periods of stagnation occur in the early growth of the animal. The unsatisfactory development, subsequently, of the ill-cared-for whey fed calf furnishes an illustration.

OVERFEEDING DURING GROWTH.

When food is feed exactly adapted to the needs of a young and growing animal, it would not be easily possible to injure the animal by overfeeding, but it would, of course, be easily possible to waste food through careless feeding. Exact adaptation has reference to feeding foods in due balance both with regard to chemical constituents and proper adjustment between the concentrated food fed and the roughage. With some foods, adaptation is so perfect that animals feeding upon them will not injure themselves and will at the same time make satisfactory development in the line sought. This is true of rich pastures grazed in summer and of clover and alfalfa hay fed in winter. Other foods fed at will may be seriously harmful, in fact, positively dangerous, while at the same time they are help-

ful when fed with due regulation. For instance, one feed of rye meal consumed at will may destroy a young animal, while a suitable amount fed from day to day with other food adjuncts would be decidedly helpful.

Injury from excessive feeding of meal to young animals most commonly occurs when they are less than one year old. During the milk period, young calves will seldom, if indeed ever, injure themselves by feeding, ever so freely, on a meal ration composed of ground oats and wheat bran fed in equal parts by weight, nor are they likely to injure themselves subsequently on such food with suitable fodder adjuncts. The reference here is to animals grown for meat. But a time comes when so much of the meal would be consumed that it is unprofitable to feed it longer at will. But suppose instead of the meal mentioned, corn was used, or rye, or a mixture of these, a time would come when development would be checked if not positively arrested. The too concentrated character of the food in conjunction with excessive amount fed has overtaxed the digestive and assimilative organs to the extent of weakening them, it may be permanently.

When the animals are being grown for milk production, the properties concerned in future milk production may be weakened by such feeding before the point has been reached when the digestive organs become impaired. The injury may come from the influence which the food has exercised on assimilation. It has strengthened the digestive habit of utilizing the food in making fat and the influence in this direction is felt even after the female has begun to produce milk. It is possible, however, if not indeed probable, that this thought has been carried too far in the rearing of dairy heifers.

When animals are so forced during the finishing period by feeding so much strong meal that they get off their feed, that is lose appetite in whole or in part, the danger point has been reached. The digestion has been more or less impaired. Cessation in feeding the meal or the grain that has caused the trouble is the remedy. In many instances, however, subsequent gains will be less than they would have been had the digestion not been thus impaired.

It is also true that dairy cows under high-pressure feeding may have the milk-giving function weakened in the absence of any symptom of indigestion, resulting from sheer overwork. The machinery of digestion has been driven at a speed so high and so continuous, that the wear has been excessive, although there has been no breaking down in any part thereof. The limit of the period of high usefulness in a dairy cow may thus be easily and materially shortened.

SELL ANIMALS WHEN RIPE.

Animals that are being fed for the block are ripe when, under normal conditions of feeding, they cease to make material gains. If kept longer the larger portion of the food is given at a loss. The loss may soon become serious, for, under such conditions they may continue to consume large quantities of food. Such ripeness is indicated by a firmness of the flesh under gentle pressure or by marked falling off in the gains under suitable conditions of feeding. In an experiment conducted under my personal supervision, pork during the fattening period, was made up to a certain point at a cost of approximately four cents per pound, whereas during sub-

sequent weeks the cost was approximately \$10 per 100 pounds, the food fed being the same in kind. The importance of disposing of animals promptly when finished is thus apparent.

The mistake, however, is far more frequently made of selling animals unfinished. Probably 90 per cent. of all the cattle sold reach the block under rather than overfinished. This more than anything else probably is accountable for the too common belief that there is no money in fattening cattle. Sometimes cattle are sold half finished because the price of food has become unduly high. At other times, because suitable food supplies cannot be obtained, but more frequently perhaps, because many do not properly understand what good finish in cattle means.

THE CHEMICAL CONSTITUENTS OF FOODS.

When foods are being fed, a due regard must be had to their chemical constituents, which means that a proper relation must obtain between the amount of protein and carbo-hydrates fed under normal conditions of feeding to insure the most satisfactory results. This relation will vary with the animals fed and the objects sought from feeding them. These varieties cannot be discussed, they are so many. There must also be a certain relation between the amount of concentrates and roughage to bring highest profits. But since this relation is a shifting quantity and is to some extent affected by food values, it also will not be discussed further.

I call attention to the important fact here, that the real value of a food factor may be more or less in practical feeding than chemistry would assign to it on the basis of food constituents. Two factors at least must be considered in judging of the value of a food in addition to the chemical constituents which it contains: The first is palatability and the second is the influence exerted on the digestion. Thus, rye straw, because of its low palatability, has a lower food value than chemistry would assign to it. Animals will not eat it freely unless impelled to do so by hunger. On the other hand, field roots have a higher food value because they favorably influence the digestion.

The further fact is also significant, that in some instances, foods may be fed at a greater profit when fed out of balance rather than in balance. This is possible when one food is so much cheaper than another, opposite in character, that it may, as it were, be fed in excess. I have fattened lambs at greater profit on a ration not in balance than on one in balance, because of the relative cheapness of corn, a leading factor in the former. In alfalfa areas it also sometimes pays better to feed protein in some excess than to incur the cost of securing other foods to balance the ration.

A MIXED DIET SUPERIOR.

In feeding animals for a prolonged period, a mixed diet is superior to a ration composed of only one or two food factors. This may, to some extent, be owing to some chemical action which the foods exercise one upon the other in the process of digestion. It is probable, however, that it is due more to the influence exercised by the combined foods on the appetite and to the more even balance that is thus likely to be secured in the mixed diet. Animals, like individuals in the human family, tire of one kind of food when fed continuously upon it. To this there may be some few exceptions.

They tire more quickly of some food factors than others. Swine, for instance, will consume corn for a longer period with a relish than barley or rye, and horses will consume oats with avidity for a longer period than any other kind of grain.

These influences are more noticeable when the feeding is forced, as when animals are ripening for the block. The appetite under such feeding slackens, hence any judicious change of diet that will lead them to consume more food will usually be found helpful.

INFLUENCES WHICH AFFECT PROFITS.

Among the many influences which affect the profits that result from feeding, but three will be discussed here, viz: The influence of food values, of cost before the fattening period, and of the price received for the animals when sold.

The influence of food values is so evident that it is scarcely necessary to discuss it. Other things being equal, the difference in returns from feeding corn at 20 cents per bushel and the same at 40 cents will be at once apparent. Some seasons the price of foods varies much. One kind of grain may be dear and another kind cheap. All kinds of grain may be relatively dear, while fodders may be cheap. Under such conditions, the aim of course should be to feed the cheaper foods as far as may be judicious in the one instance, and to utilize fodders as far as may be practicable in the other. Sometimes, however, it may be advantageous to feed more or less of the dear food, because of the advantage which results from feeding foods in balance.

Where the conditions are normal it follows that, as a rule, foods may be more cheaply grown by the farmer than purchased, but it may, notwithstanding, be necessary to purchase more or less of one or more food factors not readily procurable from home sources in sufficient quantities. The grower may thus find it profitable to purchase wheat middlings freely, notwithstanding, that he may be a large grower of corn. It is also generally true that fodders are relatively cheaper than grains, hence the larger the amount of these that may be judiciously fed, the larger will be the profits. In this fact is found the justification for the free use of corn ensilage in feeding live stock and in chaffing and mixing dry fodders with meal, in order to increase the consumption of the former.

As a rule, a pound of increase made during the finishing period costs more than the food used in making it. To this there are some exceptions, as when meat brings a good price while the foods used in making it are cheap. If, therefore, profit is to be made on home raised animals fattened on the farm, it must come from the two following sources, viz: The growing of the animals on cheap foods up to the time when the fattening begins, and the increase in value on every pound of live weight possessed by the animal at that time resulting from the fattening process. The profit of the feeder who buys the animals which he feeds can only come, of course, from the last named source.

Suppose, for instance, that a feeder purchases a steer at four cents a pound live weight, feeds him for six months and sells him for five cents a pound. Suppose the weight when purchased was 1,200 pounds and when sold 1,500 pounds, the gain being 300 pounds. Now, suppose the 300 pounds cost \$15 to make it, then no profit has

been made on the increase in weight. The profit comes from the advance of one cent per pound in the value of each of the 1,200 pounds of weight possessed by the animal when the feeding began, that is to say, it would be \$12, leaving the value of the manure to offset the labor and interest on the investment.

The close relation, therefore, between buying and selling prices in animals that have been fattened is very apparent. The difference between the buying and selling price, as a rule, should not be less than one cent per pound, if any considerable profit is to come to the feeder. Before substantial profits can be assured, this difference should be from one and one-fourth to one and one-half cents per pound.

At first thought it may be imagined that, since profit in feeding comes from the increase in value in the weight possessed by the animal at the time of purchase, the more the animal weighs at that time the greater will be the profit resulting from fattening. In many instances that does not follow, since young animals considerably below maturity make greater increase for the food fed to them.

GOOD CONDITION AND PREGNANCY.

The fallacy so extensively believed that pregnant animals should be kept in moderately low flesh has done much harm. It is of course quite possible to keep a pregnant dam in a condition of flesh too high for the well-being of the progeny, but the instances in which this occurs are few indeed compared with those in which the opposite is true.

The pregnant animal, while in this condition, must maintain herself and also nourish the foetus which she carries. The double duty thus present calls for liberal feeding. Where this is not forthcoming, the foetus is sustained in part at least at the expense of a lowered condition of flesh in the animal. This of course reduces the ability of the dam to properly nourish the offspring after birth.

After the young animal has been born, the drain upon the dam for its sustenance is usually heavy. To meet this need, the tax upon the system of the dam usually lowers her flesh though liberally fed. It follows, therefore, that a dam in good condition when her offspring are born can nourish them better than one in low condition. The former has stored up flesh previously which is now drawn upon to feed the offspring.

COMFORTABLE HOUSING.

Animals that are being fattened must be protected from excessive cold or the cost of food in proportion to the gains made will be materially increased. It is probable, nevertheless, that more loss results from keeping animals too warm and closely confined while being fattened than from exposing them unduly to cold. Recent experiments have shown that animals fattened in sheds with liberty to move about in the same and also in yards adjacent, have brought higher profit than those tied in the stall. The former consumed more food, but they also made greater gains.

The degree of the exposure or of the protection that should be given varies with the class of the animal. Sheep, for instance, will bear more cold than cattle and cattle than swine, but it is imperative

that all animals that are being fattened shall be protected from storms. Food is expensive heating material.

CONDITIONS OF COMFORT.

The feeder who attains to marked success in this line of work must study carefully the needs of the animals which he feeds. If the conditions prove too warm through change of weather, more ventilation should be promptly given. If they prove too cold, additional attention should be promptly given. If an animal gets off food, immediate attention must be given to its needs. The more completely comfortable that animal can be kept, the better will they flourish, and it will be the constant endeavor of the faithful stockman to make them comfortable. While engaged in such work, he can never come down from the watch-tower of vigilance, and his reward will be proportioned to the fidelity and intelligence which he has shown in his work.

Mr. Sexton, in answer to an inquiry of Prof. Shaw, made the statement that the soil of Pennsylvania does not produce a good crop of Canada peas; he stated that in New York they raised from thirty to thirty-five bushels per acre, but not here.

PROF. SHAW: Mr. Chairman, I am here to say that if you can't make a success of growing Canada peas as a forage crop along with oats, you can't make a success of them in growing them separately.

A Member: Why grow peas on land where you can grow 65 to 75 bushels of corn to the acre. Would you do that?

PROF. SHAW: I would, under some conditions, because you can't grow the corn every year on that land; you must have protein, and I think you can grow it cheaper than you can buy it. Perhaps you think you can buy it more cheaply.

I would like to ask if there is anybody in the room who has grown alfalfa on their farms. If so, kindly hold up your hands.

Several stated that they had tried to grow alfalfa and failed.

MR. HUTCHISON: Have you ever had any experience in feeding alfalfa meal?

PROF. SHAW: I have not, personally, no. I imagine, though, that alfalfa meal would be all right if you haven't to pay too much for it.

MR. HUTCHISON: The trouble is to get the animals to eat a sufficient quantity of it.

PROF. SHAW: I do not think it would pay to feed alfalfa meal to anything only calves. I do not think it would pay to buy it to feed it to animals older than calves, young calves at that.

A Member: Would you expect the meal to be worth more than the alfalfa before it was ground?

PROF. SHAW: It would be only worth more in this respect; the grinding is a sort of mastication of the alfalfa, and it might be a little less indigestible; it would probably take a little more of it than it would of hay; a very young calf, I am speaking about now.

The SECRETARY: The labor of mastication would be saved, and of course that would be something, and the amount of feed after it was ground would be very much in its favor, wouldn't it?

PROF. SHAW: It would be somewhat, yes.

A Member: If a man was successful in raising clover to balance his corn, would you still advise him to spend his time trying to raise alfalfa, provided he had tried to raise alfalfa without success?

PROF. SHAW: I would, unless he had exhausted every reasonable method for raising alfalfa, for this reason, that alfalfa has some advantages over clover; it will produce more per annum as a rule and it will stay in the ground, or ought to stay in the ground for a number of years, and these are two important advantages it has over red clover.

MR. HUTCHISON: What experience have you had in inoculating soil?

PROF. SHAW: I will tell you one experience I had in Minnesota. I had an opportunity to do this, to show alfalfa on a piece of land on the first of May, and it grew fine. It was cut off a couple of times in order to cut the weeds along with the alfalfa, and as it was cut off, it was just allowed to lie on the ground in the form of a mush, to about the first of September; that alfalfa then began to pine, began to pine more and more as the autumn advanced. Then I began to conclude that that ground needed inoculation, and I said to the man, drive a couple of loads of our best farmyard manure across that field, and the manure was put on, and the next Spring that was the only part of that field in which the alfalfa was worth the cutting, and in the month of June where that alfalfa was, it was growing good and strong, and I found tubercles in abundance in that alfalfa, on the roots of the plants.

I do not think, gentlemen, I should detain you further in regard to this question, but I do regret that we cannot get our farmers to think more in regard to this thing than they do. I do not refer to the farmers who come to the State Board of Agriculture, or to Farmers' Institutes, but I do refer to that great mass of the farming community.

I was in the State of Indiana not long ago, and my heart was cheered by the fact that 1,100 farmers of that State had been persuaded to come out and spend a whole week to study questions pertaining to corn and livestock, and I did conclude that the possibility of bringing together such a meeting as that in one State argues well for the future in the dispersion of knowledge throughout the Commonwealth, and of lifting our farmers to a higher plane in these United States.

MR. HUTCHISON: I see in looking over our list of members, that the Hon. John A. Woodward's time expires this year, and he has not filed his credentials with the committee, but he has been always an active member in attending our meetings and taking part in our deliberations, and we all appreciate the work he has been doing for agriculture; and now without consulting him at all I would move that he be admitted as a member of the Board for the

term of three years, and that he file with the Secretary his credentials from the Agricultural Society in Centre county.

Motion being seconded, and the question being put, it was agreed to.

MR. HERR: Mr. Chairman, it is the first case I have ever heard of where a man has been elected to membership in the Board of Agriculture when we don't know whether he desires it or not.

COL. WOODWARD: Mr. Chairman, I will state that the action taken was an absolute surprise to me, and the reason I had not presented my credentials, is that I hadn't thought of it, and as the Society had no meeting where the matter could be attended to, it was not done. I was unable to attend to any kind of business during a large portion of the year, and during the latter portion I have been extremely busy, and it escaped my attention entirely. I came here supposing my term had not expired, and did not know until my attention was called to it yesterday, that it had. I very much appreciate the implied compliment, but will not consider myself a member of the Board until my certificate is filed, which I have no doubt it will be in good time.

The CHAIRMAN: The thought ran through my mind, whether it would be in order to put this question, but considering that Col. Woodward had an Agricultural Society back of him, which would be sure to select him, I felt sure it would be all right. I do think that there are some things we should know as members of this State Board of Agriculture. There are quite a number of counties that do not send any representative here; whether they have agricultural societies that entitle them to have representation here, I do not know; I do not know how many of our members know. Another question that arises is, when credentials are sent in here, some of them are lacking a little in form; some of them are lacking the seal, and the Credential Committee in such cases, do not know exactly what to do. Probably some of these agricultural societies are not living up to the law and have not got the right to elect a member. Now I think it would be wise if we would take some action by which we can have our members elected from societies that are working under the law; and in counties that are not working under the law, I would like to see the right to elect members given to other counties that would elect members in accordance with the provisions of the law, so that we might have a full membership in this Board.

PROF. VAN NORMAN: Prof. Shaw has referred to a gathering of farmers at the Indiana Agricultural College for a week. Having been there for several years and knowing the magnificent increase of interest that has been developed there, the inquiry has run through my mind, Why can't we have a farmers' week at Pennsylvania State College? Do you want a week up there? A week in which we shall get such men as Prof. Shaw and other men who are specialists along dairying, horticultural, corn and beef lines, that are appropriate to the agricultural interests of the State, who shall supplement the work that is now being done, and give you a week of practical instruction when we can bring out the stores that we have and show you the dairy cows that we have there. I

believe we can make a week there worth your while, and if you say you want it, we will do what we can to help bring it about. Now I put it up to you, Do you want it?

DR. FREAR: Mr. Chairman, I am very happy indeed to second the suggestion of Prof. Van Norman. I have recently come from a brief visit to Kentucky. I had a very pleasant day with my friend the Director of the Experiment Station in that State. He was full of the alfalfa and corn trains which are being sent over that State for the instruction of farmers. I asked him how the work was conducted. He said the train ran into a place and the people gathered and they stayed there for an hour or two, and then it ran on to another place. I had a talk a short time ago with Prof. Peterson and he told me of some of the experiences in that State, but he said, the trouble is, the time is too brief.

Now can't we help you? Do you wish to be helped to a practical presentation of what has been done and can be done by the men who have succeeded in carrying out some of the latest developments in these special branches of agriculture that are promising good results in Pennsylvania. If so, we shall be glad to do what we can to organize a week for you that will be profitable, inspiring and not only a help to you, but to many others.

COL. WOODWARD: Mr. Chairman, as a member of the Board of Trustees of the Pennsylvania State College, I wish to assure all my fellow-members of the Board, as the representatives of the faculties have already assured you, that the Board of Trustees will do everything in their power to make it a comfortable and profitable week for the farmers of Pennsylvania as soon as the necessary arrangements can be made.

MR. WELD: Mr. Chairman, just a few days ago I had a letter from a gentleman who is the director at the station in the territory of Oklahoma. He told me that they just got through with a farmers' gathering at Stillwater, Oklahoma, which had been very successful. I think if the territory of Oklahoma can do these things, the old Commonwealth of Pennsylvania ought to heartily second the suggestion that has been made by the experts of the faculty of the Pennsylvania State College.

The SECRETARY: I would like it if Prof. Van Norman would repeat his remarks or would state specifically what is contemplated to be done.

PROF. VAN NORMAN: Possibly I can best answer that by telling you what Indiana has done, to which Prof. Shaw referred when he stated that 1,100 farmers were over there at the College where they held a week's session for the farmers, and they came up there, and then they gave that time up to just such instruction as Prof. Shaw has given us here, straight through the week; then the same with corn as the topic. Then they supplemented that by using a portion of the time in the practical demonstration of what had been accomplished along certain definite lines, such as dairying and so on, where the steers or the dairy cattle are brought right in. Then in another place they had arranged there long tables, and each farmer is expected to become a student, and take a seat for instance to study the question of seed corn.

Now then, my inquiry was, Do you gentlemen want something of that kind in this State? I have been told that there are men growing corn in this State that are just as competent to show you correct methods and to make suggestions in regard to corn, as there are in Indiana or in any other state, and men who are interested in fruit, and those interested in the varieties in fruit, can sit down and study and talk over it for a week with a collection of men that you can't find anywhere else. Those of you who are interested in dairying, we will try to get together and we will exhibit the butter, and will bring the livestock out for examination. Iowa took three carloads of horses from Ohio for their farmers' week in order that the farmers interested in horses might have animals of the right kind to examine and judge. I do not hesitate to say, gentlemen, that lots of you have never seen steers such as Prof. Shaw has seen at the international livestock show.

If you will come up and see what we have there, I am sure it will be profitable to you. I believe that we have some animals there that we need not be ashamed of, even if we have not got any of the prize Shorthorn animals. Minnesota last year had the grand champion of all; Indiana had the next, and Iowa got it this year. That shows that in the colleges there are men who can feed, who understand the principles of feeding, and I believe we can get some of those men to come and tell us how it is done, and the question is, Do you want them? If so, Prof. Frear and Col. Woodward will get together and we will all help all we can.

The CHAIRMAN: Is it the idea that we are now to consult our people and then determine this matter?

PROF. VAN NORMAN: Yes, or if you want to make some expressions of approval or disapproval, that will put you on record here.

The CHAIRMAN: You do not contemplate the Board taking any action at this time?

PROF. VAN NORMAN: That is up to the Board to do what they wish to do. You have the suggestion before you now.

COL. WOODWARD: This invitation is extended to the farmers of Pennsylvania, it will be understood, irrespective of whether they are members of the Board or not. It is simply intended, I judge, to send the invitation out to the farmers by their representatives here in this Board and that this meeting shall be a meeting of the actual farmers of Pennsylvania of all grades and classes and the expression sought by Prof. Van Norman, if you will allow me to interpret him, is the disposition of the farmers to have such a meeting at the college at some part of the year, at a time to be hereafter decided upon. There is nothing to be decided here today, excepting that that would be a good thing for all the farmers of Pennsylvania who can be gotten there.

MR. McCracken: In order to bring this matter before the house, I will move that it is the sense of the State Board of Agriculture, that the invitation to the farmers of Pennsylvania to spend a week at the State College of Pennsylvania, be accepted.

The motion was seconded by several members.

PROF. VAN NORMAN: I just want to say that I am not in a position to extend an official invitation; that is a little strong. If the Colonel approves that, then I am all right.

COLONEL WOODWARD: I am perfectly willing to assume that position and responsibility for the Board of Trustees and for the Faculty, as I feel sure it will meet with their hearty approval.

PROF. VAN NORMAN: My idea when I made the remark was to throw it out to you as a suggestion or a feeler.

MR. BLYHOLDER: Are we in a position to accept an invitation for the farmers of the State of Pennsylvania? I believe that our motion had better be that we approve of such a meeting. I think that that will be advisable. I do not believe that we are ready or authorized to accept the invitation on the part of the farmers of the State.

MR. McCRACKEN: Mr. Chairman, my motion was that it was the sense of this meeting that the invitation should be accepted.

MR. HERR: I think if the motion was passed as he put it, it would be construed to be an invitation to the Board of Agriculture, and I want it to be extended to the farmers of the State and not be confined to the Board of Agriculture.

The CHAIRMAN: I think that is the sense of the motion, as understood by the Secretary.

MR. McCLELLAN: I would like to inquire whether the people at the State College or in that vicinity would be able to take care of three, five or seven hundred people that would meet there at one time.

PROF. VAN NORMAN: That thing ran through my mind. I believe that we have dormitory facilities for between five and six hundred students in the town. If you gentlemen are willing to come after Christmas, there would be a week before the opening of the next term. I know that we have quite a good eating-house up there in the campus, and I think that the sleeping business can be taken care of when you get there.

The SECRETARY: Would it not be better to come in the summer than in the winter?

PROF. VAN NORMAN: Farmers can usually get away better in the winter than in the summer.

The CHAIRMAN: This brings the subject up for consideration and it will work itself out in the future, and this motion, as I understand it, does not bind this Board to anything only to take the matter home and endeavor to educate our people to it. Is that correct?

COL. WOODWARD: That is correct.

The question being put, it was agreed to.

Dr. Rothrock was called for and came forward.

The Chairman: It is not necessary to introduce Dr. Rothrock to this audience.

DR. ROTHROCK: Mr. Chairman and Gentlemen: I did not understand that I was expected to speak. I just came in from the mountains. I am very glad to be with you again, and very glad to meet you all. I do not come now in an official capacity, but come because I want to see you.

There was one point that I listened to with a good deal of interest, and that was in regard to alfalfa, or rather, the address on alfalfa; I just came in when you were hearing it. I know a good deal about the difficulty of growing alfalfa. I have made several attempts myself to start alfalfa and unfortunately have been unsuccessful; but a number of years ago I was up in Pike county in this Commonwealth, and in front of one place where I was stopping, a gentleman brought a little sprig of something, and I looked at it, and I said, why that is alfalfa. I said, How did it get here? Did you ever sow alfalfa? No, they had never sown alfalfa. It was an old lawn, an old sod which had been in existence probably for fifty or sixty years. I said, I want you to mark that sprig of alfalfa and see what becomes of it, and as far as I was able to trace it, that sprig of alfalfa has been growing and increasing its area. I suggested that I thought it might be due to the fact that the seed had been dropped right in the grass, in the soil. I tried that, but I did not get a good result. I tried it at different seasons of the year, but did not get a good result. Evidently that alfalfa was dropped in among the grass. I know the value of alfalfa. I know it is of great value and that it is a great western crop. It grows down in New Mexico, and in South America it is in common use, and has been for years in Southern Europe, particularly. Now I would like to ask the gentleman who addressed us on alfalfa, if he can give us any explanation of this Pike county phenomenon? I do think that if alfalfa could be started that an immense gain would be had. I know that we need all those things.

I am not one of those who believe in the Malthusian doctrine that it is necessary for wars to lessen the number of the human race, and sweep away the inhabitants of the earth. I do not believe in that doctrine.

Just at this point, the Governor of the Commonwealth came in.

The CHAIRMAN: I am glad to introduce to you the Governor of this Commonwealth, Samuel W. Pennypacker; although it is hardly necessary, as I think you all know him.

GOVERNOR PENNYPACKER: Mr. Chairman and Gentlemen, I have been very busy to-day and have had no time at all for the preparation necessary to meet with you, and it only remains for me to say that it is an exceedingly great pleasure to me to be with you.

Sometime ago as I was on my way down toward the Perkiomen, I met a man in the station at Reading, and he came to talk to me, and I talked with him, and the matter was dismissed from my mind; but I heard afterwards that he had given a report of the interview and he told his friends, referring to me, that I was the most unassuming person he had ever met; that I looked just like an old farmer. Now, whether that was more complimentary to me or less complimentary to you, I leave you to judge for yourselves.

It seems to me that in one most important respect, the occupation of a farmer differs from all other avocations of life. You hear

a great deal about the business which men conduct, and the professions which they pursue, and the wealth which they acquire, and we know that the wealth which is accumulated under present conditions by men who are engaged in the coal oil business and men who operate coal mines, and men who conduct railroads, is often enormous. It is not so often that we hear of great fortunes accumulated by the farmer, but the man for instance, who takes coal oil out of the earth, presently, toward the close of his life, you hear of his being possessed of a hundred millions, with an ambition to be the richest man on earth, to be presently a billionaire. When you look right down to the foundation of it, what does his fortune represent? Ages ago the Lord put under the surface of the ground that natural deposit of oil, doubtless intended to be for the benefit of humanity in future ages, and by some process he has secured possession of it. He didn't put it there; he didn't make it; he found it, as it were, or the conditions were such, the commercial conditions which this immense deposit of wealth represented were such, that it has fallen to him. You look at the coal and it is substantially the same thing. Countless ages ago, huge forests grew over the earth, and presently the wood was gathered together through the instrumentality of a deluge of water, and deposited in some place or other with a superincumbent mass of earth that was heaped over it, and was presently carbonized, and there was the coal. The men who get out that coal, think of course, that they are great business men; that they are advancing commerce. They talk to you about commercial interests, but remember that every ton of that coal which is taken out and sent abroad, is just that much native force gone. So far from seeking to distribute and scatter it, so far from regarding it as a public benefit, that it should be sent over to Manchuria to enable the Japanese to shoot Russians, or the Russians to shoot the Japanese, it represents just that much waste, just that much dispersion, and the men who handle it have nothing to do with the accumulation of that wealth.

With the farmer it is a different proposition. Every ear of corn, every blade of grass, every beet and turnip, every calf that grows to a cow on his place, represents his own productive work, therefore, it is manifest that not only all those people live because of the work which the farmer does, but his work represents not waste and destruction, but an addition to the material welfare of humanity and productiveness, and it is in this respect that the work of the farmer differs from that of almost all the other men who have their lives and being upon the face of the earth.

Now I have talked to you rather longer than I expected. As I said, it is a great pleasure to me to be here with you; I am a sort of a dilettante farmer myself. I have two farms, and I undertake to see them every two or three weeks. I go over them and fancy they belong to me and see what is going on. To some extent I supervise them and see what is being done. In that sense I may be said to be a farmer, and I am very well satisfied that it is so.

I found this by experience as well as by observation: When a young man, with all his aspirations and ambitions before him, starts out on his career, he thinks it would be a great thing to go out into the great crowd where things are moving amid the noise and cries of trade and commerce, where things are going along, and to venture

his fortune there. He tries it, and ninety-nine times out of a hundred he fails. He had better have stayed at home and kept out of such crowds, and the hundredth man who has succeeded feels as he gets along in life, as he gets older, as he perhaps accumulates stores of wealth, that he wants to escape from it, and to get back to the quiet farm life where he was born.

I am pleased to see you here and to see so many of you, and I am quite sure that your deliberations will be impressive and successful, and will result in accomplishing much good, not only for yourselves, but for the Commonwealth in which you live.

The SECRETARY: Now Mr. Chairman, the Governor tells me that he had hoped that he would be able to take you all by the hand.

The GOVERNOR: I will do that if they wish it.

The Governor then held a brief reception during which he shook hands with all present.

On motion, duly seconded, the meeting adjourned to 7.30 o'clock P. M.

Harrisburg, Pa., 7.30 P. M., Thursday, January 25, 1906.

The meeting was called to order at the designated hour, with Mr. P. S. Fenstermaker in the Chair.

The CHAIRMAN: We are now ready to receive the Report of the Committee on Identification of Fruit.

The report of the committee was presented and read by Dr. J. H. Funk as follows:

REPORT OF THE COMMITTEE ON IDENTIFICATION OF FRUIT.

Your Committee to name fruit respectfully submit the following report:

We have examined the fruits displayed and find the display of excellent quality. Mr. Chester Tyson, of Floradale, displayed nine plates of York Imperial.

A. I. Weidner, of Arendtsville, displayed: One plate, York Imperial; one plate, Smith Cider; one plate, Ben Davis; one plate, Dominee, one plate, Mumper Pippin.

C. B. Hege: One plate, Grimes Golden; one plate, York Imperial.

Col. H. C. Trexler, Lehigh county, displayed one plate, King.

M. M. Naginey, Mifflin county, displayed one plate, York Imperial; one plate, unnamed.

The above fruit was especially fine, smooth, clean from fungi and codling moth, and of high color, showing that with the care taken by above exhibitors the finest of fruit can be and is raised in Pennsylvania.

J. H. FUNK,
J. F. BOYER,
A. I. WEIDNER,
Committee.

DR. FUNK: Mr. Chairman, I wish to say in regard to these York Imperials, that I think they are about as fine a York Imperial as we often see; in fact, I think there is no place in the State of Pennsylvania or any other state that produces as fine a York Imperial as we find in York county and Adams county, the home of that apple; and those people are especially progressive along that line. They are spraying almost to a man, and the result is, they get fine fruit there. The York Imperial is not as good an apple as a great many others, yet you all noticed here this afternoon that everybody wanted apples and they were all distributed, except one lone plate of Ben Davis, and I had to almost insist on the Secretary taking one, and then he said, instead of taking them for himself, he would take them for his wife.

It was moved and seconded that the report be received and placed on file, which was agreed to.

MR. HERR: Mr. Chairman, I would call your attention to the fact that the Chairman of the Committee on Apiary is here. He has not been called upon yet.

The CHAIRMAN: I think that is true; it is my fault.

MR. WELD: Mr. Chairman, I would like to know if this exhibit of fruit is to be continued from year to year?

The SECRETARY: It is, until some other action is taken. I would like to ask the question now, whether it is the sense of this Board that an exhibit should be made at the Spring meeting, if the meeting should be in the Spring, or will you leave it to the judgment of the Secretary, whether preparation shall be made for it. If our meeting should happen to come when there isn't any fruit to display, as it might be, as it was done at West Chester. What do you think about it, Brother Herr? What was in your mind when the motion was made?

MR. HERR: I do not think we can have a display the last of May that is worthy of any particular notice, unless it be of small fruits. It is a little doubtful whether the strawberry season will then be sufficiently advanced to permit of an exhibit. If they hold it in May it is hardly likely that it will be ready, and I do not think it is worth while to try to make a display at that season of the year. If it is held in October, I think that is an ideal time to bring fruit of all kinds here.

The SECRETARY: Perhaps it ought to be left to the discretion of the Secretary as to whether an exhibit shall be made.

MR. HERR: That is the idea, and I will make that as a motion.

The SECRETARY: I will understand it that way without a motion if that is the idea.

MR. CLARK: Mr. Chairman, it seems to me that it might be well to add to this exhibit, corn. When we look over the improvements that are going on in other states, the great effort that is being made to increase the growth of corn, I am satisfied that this State can profitably spend some time and some money to try to increase the growth of corn and get the best. It seems to me that it would be a very small matter for each member and some of his friends, to send

an exhibit of corn, and we could see then what was going on and then get the best. I do not know whether it would be right for me to make this as a motion, but it strikes me as though we ought to do something along this line.

MR. NELSON: Mr. Chairman, I think that is a good suggestion; I think it might be possible to broaden it out a little. We had that up in our county, to have some general exhibition in that line and whether that would be practicable and how far that would go would depend on the action taken by this Board, whether it will only be just for fruits or to include some of the cereals also; there may possibly be some contest in that line, and there may be some very good specimens if put on exhibition and the question is, How far will we go in that line?

The SECRETARY: My thought is that the people in the community where we meet can make just whatever kind of a display they care to make. That will be part of the reception that will be given to the Board. We don't care how large it is because usually the fruits are divided among those that are present. I don't know that any of us will care about carrying away any corn.

MR. HERR: Mr. Chairman, I had the pleasure of attending a meeting at Atlantic City, and there I saw one of the finest agricultural exhibits I ever witnessed in all my life. It was simply the products of New Jersey, attractively arranged by the different Pomona Granges of the State of New Jersey. Now I would like to make a motion, to allow Clearfield to make a competitive exhibit at the meeting, if it is held there in the Fall, if they do it at their own expense.

MR. BLYHOLDER: I would ask the gentleman if he hadn't just better make it that any county where the meeting is held as well as Clearfield county. The idea I want to include is, that any place where we hold the Fall meeting it shall be done, so that if we see fit to go to some other county, that they will be allowed to make that exhibit.

MR. HERR: A standard exhibit?

MR. BLYHOLDER: Yes.

The SECRETARY: I don't quite catch your idea.

MR. HERR: My idea was that the people of Clearfield county be invited to make such an exhibit as they see proper to make, provided they do it at their own expense.

The SECRETARY: I second that motion.

MR. BLYHOLDER: Mr. Chairman, I would move you then, that the motion which calls for an exhibit of fruit be so amended as to read "fruit and corn."

MR. HERR: Mr. Chairman, I will amend the motion by saying "cereals."

MR. NELSON: I second the amendment.

MR. HERR: Mr. Chairman, my motion was to amend the motion made by Mr. Blyholder; his motion has not been acted on yet.

The SECRETARY: I only heard the one amendment. Mr. Blyholder's motion was that the standing resolution shall include corn,

and I heard an amendment that it should be cereals instead of corn; that is all I heard.

MR. HERR: That is the idea.

The question being, shall the amendment prevail? It was agreed to.

The question then recurring on the original motion, as amended, which was also agreed to.

The CHAIRMAN: We will now hear the Report of the Committee on Apiary, J. W. Nelson, Chairman, Shawville, Pa.

Mr. Nelson presented and read his report as follows:

REPORT OF THE COMMITTEE ON APIARY.

BY J. W. NELSON, *Chairman.*

The spring of 1905 found the bee industry in a bad condition, owing in part, to the extremely hard winter and in part to the prevalence of foul or black brood over a large part of the State. Spring opened with fair weather during fruit bloom; followed by an abundance of clover bloom. But the weather was so wet during the last of May and the month of June that no surplus was gathered. July was a beautiful month and some surplus was gathered. There was an abundance of buckwheat, but most of the nights in August were too cool and no buckwheat honey was gathered worth while. September was also cool and no white honey was gathered. On the whole the season was medium; good in places and poor in others.

Nothing has been done in the way of legislation to protect the bee keepers from the ravages of foul or black brood. I think a county law would be best if properly framed, but the best remedy would perhaps be to educate the farmer at the Institutes and by Bulletins. As to the contagious character of these diseases, to this end I attach an article by E. W. Alexander, of New York, including the introduction by E. R. Root. These and other experiments along this line would seem to indicate that it is possible to exterminate the diseases, if done intelligently, and that too without destroying the diseased property. If this hope proves true, and I think there is no doubt it will, it means thousands of dollars to the industry, for there is no branch of agriculture that will yield so much return for the money invested, either in money or information.

It would be hard indeed to find a more interesting subject for study than apiculture. As an introduction to the subject of Nature study nothing else will compare with it. The bee is a most marvelous piece of creation, as to its physical structure in which it shows its wonderful adaptation for the work it has to perform, but it is the living link between the members of many families of the vegetable kingdom and becomes the active agent in cross fertilization in the perpetuation of their species. It will thus be seen that one can not progress far in the study of this little insect without discovering one of nature's most mysterious processes. It would

be hard to find anything more interesting than the little realm bounded by the walls of a beehive. When we enter that domain; or better, observe it through a glass wall, it is to find a most orderly and perfectly regulated commonwealth, its thousands of inhabitants working in perfect harmony, an example we might well imitate. There ought to be the most friendly relations between man, the highest form of animal life and the honey bee, his most useful friend among the insect world. It has become such a fixed notion in the minds of most people that bees sting, that one would think that stinging was their principal business; but while all working bees can and will sting if occasion requires, the fact is most bees never do sting at all. Few of us realize the magnitude of the forces in operation in the material world about us and fewer still have the time or the opportunity to study how those forces operate. Only a very few can have the means to penetrate the depths of the heavens to explore them to add to the sum of human knowledge, but any one with an eye to see and a mind to grasp may walk afield and find the world a great hive of industry in which myriad forms of insect life are working out world processes. It is getting to be more and more necessary to know about these creatures. Some of them enemies and some of them friends of man. At the head of the list of friends stands the honey bee. Get acquainted with it, its acquaintance will do you good.

The following is the article by Mr. E. W. Alexander, as noted above:

HOW TO RID YOUR APIARY OF BLACK BROOD.

A Cure that is Easily and Cheaply Applied without the Destruction of Combs, Bees, Hives, or Utensils; a Valuable Article.

[It may, perhaps, stimulate a more careful reading of this article than it would otherwise receive when I state that we have paid Mr. Alexander for the privilege of giving this method to the world more money than we have ever paid for any other article we have ever published, several times over. Black brood, or the New York bee-disease, probably the most destructive of any brood disease, was raging among Mr. Alexander's bees with unabated fury three years ago. When he blundered on to this cure he scarcely realized that he was going to rid the bees of the disease; but the proof of the pudding is in the eating. I personally inspected hundreds of the very combs that were, three years ago, badly infected, and which at the time of my visit were filled with as nice solid healthy brood as one could wish to see. There was only one colony that had a cell or two of the disease, but this was not treated strictly according to the method to be described. One or two of the details were omitted to see how far he could deviate from the plan. It is, therefore, with more than ordinary pleasure that we are placing before the bee-keeping public one of the most valuable communications that it has ever been our lot to give in these columns. I expect to have it all printed in small pamphlet form, and send it out for free distribution by the thousands. Of course, I may be mistaken as to its value, but I hope it will be the means of entirely emancipating the State of New York from the ravages of this dread disease, and other places where it may find a footing.—Ed.]

"This has been one of the hardest problems for me to solve that I have ever met in bee-keeping. For three years we tried everything in the line of disinfectants that we could hear of, also putting our bees on foundation, which did but little good. Some of the things

we tried seemed to help at first to check its deadly work; but in a short time it would show itself again as bad as before; and so the years went by while we lost nearly our entire honey crop and over a thousand colonies before we got the first sign of a cure, and even then it was so simple it seemed like a drowning man catching at straws. But I kept at the little proof I had until I developed it into a perfect cure. Then for three years we tested it thoroughly on hundreds of colonies, so that we could be sure it was a cure which could be depended on, and now I send it to *Gleanings* for the A. I. Root Company to give to the world.

"This cure is on the line of introducing new blood into the apiary, which will necessitate getting a choice Italian breeding-queen, one of the best honey-gathering strains that can be procured. For this special purpose I prefer quite yellow Italians. Now for the cure.

"Go to every diseased colony you have, and build it up either by giving frames of maturing brood or uniting two or more until you have them fairly strong. After this, go over every one and remove the queen; then in nine days go over them again, and be sure to destroy every maturing queen-cell, or virgin if any have hatched. Then go to your breeding-queen and take enough of her newly hatched larvæ to rear enough queen-cells from to supply each one of your diseased queenless colonies with a ripe queen-cell or virgin just hatched. These are to be introduced to your diseased colonies on the twentieth day after you have removed their old queen, and not one hour sooner, for upon this very point your whole success depends; for your young queen must not commence to lay until three or four days after the last of the old brood is hatched, or 27 days from the time you remove the old queen. If you are very careful about this matter of time between the last of the old brood hatching and the young queen commencing to lay, you will find the bees will clean out their breeding-combs for this young queen, so that she will fill them with as fine healthy brood as a hive ever contained. This I have seen in several hundred hives, and have never seen a cell of the disease in a hive after being treated as above described.

"It is not necessary to remove any of the combs or honey from the diseased colony; neither is it necessary to disinfect anything about the hive. Simply remove the old queen, and be sure the young queen does not commence to lay until three or four days after the old brood is all hatched. This treatment with young Italian queens is a perfect cure for black brood.

"In regard to those old queens that were formerly in your old hives, I think it best to kill them when you first take them from their colonies—not that the queen is responsible for the disease, for I am sure she is not; but a young Italian queen that has been reared from a choice honey-gathering strain is worth so much more to you that I can not advise saving these old queens.

"I have experimented along this line considerably, and found, after the colony has been without a queen 27 days, as above directed, it will usually be safe to give them one of these old queens, and the cure will be the same. Still, there have been exceptions, so I advise killing them at once.

"Now a few words about your breeding-queen. Buy one of the very best you can for this purpose; for upon her real merits rests the true value of your apiary hereafter. I would buy a three-comb

nucleus with this valuable queen, so as to run no risk in introducing her to a full colony.

"Now, my friends, don't let another season pass without cleaning your apiary of black brood, and also at the same time requeen it with young Italian queens so you will not only harvest a fair crop of honey next summer, but will have an apiary that you will be proud of and take pleasure in showing to your friends. I know many of you have become discouraged in trying to rid your apiaries of this fatal disease; but that does not help matters any. The only proper thing to do when these troubles do come is to face them with a determination to overcome any and every obstacle that comes in your way; then when success rewards you for your perseverance, how pleasant it is to look back over the past and realize that you have accomplished all you labored for. I hope that you who have this disease in your apiaries will give this treatment a thorough trial next season, and please report the result of your trial to *Gleanings* so that every reader of it will have your opinion of the method."

I wish to call our readers' attention to the fact that there are two or three important factors in administering this treatment. The first is Italians, with a preference for the extra-yellow stock. Experience has shown in thousands of instances that black bees are very much more prone to get this disease in the first place, and when they do get it they are more liable to succumb to it than Italians or Carniolans. Put this fact down big.

Second, the bees must be *given time enough to polish up*—that is, disinfect their combs *in anticipation* of a laying queen; for, as Mr. Alexander points out, the bees must not be allowed to have a queen until after 20 days of queenlessness. The *rationale* of this is thorough cleansing and disinfection. During the 20 days that intervene, the bees are *constantly expecting* a queen, and therefore polish and repolish up the cells ready for her. This scrubbing apparently cleans out all the old germs of the disease. During the interval of twenty days the nurse-bees use up all the chyle, or larval food, containing a taint of the disease.

Now right here this question may come up. When brood-rearing stops in the fall, there is not only 20 days without brood, but many times 20. Why, then, should these same colonies next spring, as they have repeatedly, come down with the disease? Mr. Alexander explains it in this way: When the queen stops laying in the fall, the bees do not polish up the combs as they do in the height of the season, when the bees are fairly howling for brood or eggs. The combs are left smeared with dead brood; the stuff dries on hard, and is not removed till the subsequent spring; but in the height of the laying season or brood-rearing season the combs are cleaned up, when the dead matter can be removed in a sort of viscid state, and before it has been glued fast to the walls of the cells. Mr. Alexander and myself talked it over in company with no less a bee-keeper than P. H. Elwood, who was present one of the days when I was at Mr. Alexander's yards. On no other ground can be explained this cure, except, possibly, that the disease might have run its course at the Alexander yard, the same as many infectious diseases do. But when we understand that black brood continues on in other yards in the immediate vicinity where this treatment has not been applied, we

are almost forced to the conclusion that the Alexander plan has a great deal to do with the disappearance of the disease.

Another fact that seems to be a part of the treatment is, that of the removal of the old queen. In view of the fact that it always pays to requeen at least once in two years, and sometimes oftener, we can hardly count the destruction of the old mother an actual loss. The only loss we can figure on at all is the absence of all brood for 20 days; but this does not compare with the nuisance and expense—the great expense—of destroying thousands and thousands of good combs as well as the frames containing them, even if we melt them up, the return is small, comparatively. Then there must be the foundation, which, according to the McEvoy treatment, must be cut out at least once, compelling the bees to try again.

Up to the present time the McEvoy treatment was considered the most effective, but not a cure in many cases. The reason for this is not hard to understand. The destruction of the old combs and the compelling of the bees to draw out two sets of foundation involves the cessation of brood-rearing at least a week and probably longer, and, at the same time, the entire removal of the source of infection that might be in the old combs. But the treatment too often failed because the germs of the disease would still reside in the alimentary tract of the bees, sufficient time not having elapsed (20 days). As soon as the young larvæ require feeding, the larval food itself would be liable to have the germs and reinfect the young brood.

Another interesting fact is, that Italians are more proof against the disease than the blacks; and why is this so? Probably because they are less inclined to rob, but more probably because they do a more thorough job of housecleaning than the native bees of this country.

E. R. ROOT.

DR. FUNK: Mr. Chairman, I would like to ask Mr. Nelson what he has to say about the non-stinging bees.

MR. NELSON: I will say in reply to Dr. Funk that I have not had any experience with them. I see there has been a great deal of experimenting done with them, but it is only experiment.

DR. FUNK: Isn't the Government doing something in that regard?

MR. NELSON: The Government is distributing different varieties of queens to the United States to people who understand handling them, among others, the bee of Africa, or the large bee. There has been many an attempt made to domesticate them, but it has not proved a success yet.

DR. FUNK: It is not a stingless bee, is it, really? They have stings, haven't they?

MR. NELSON: No, they are a stingless bee.

DR. FUNK: I thought it was like a queen that don't sting.

MR. NELSON: That is not correct. They use it sometimes.

DR. FUNK: Yes; use it royally.

On motion, duly seconded, it was ordered that the report of the Committee on Apiary be received and placed on file.

The following is the Report of the Committee on Poultry:

REPORT OF THE COMMITTEE ON POULTRY.

BY N. G. TEMPLE, *Chairman*.

The increased attention that is being devoted by the public to the subject of Poultry Keeping is attributable mainly to one or other of two widely different causes, as either the large number of exhibitions of high-class fancy fowls has attracted the attention of the amateur, or else the official statements that have appeared concerning the vast sums of money which the inhabitants of this country pay the foreigner annually for poultry and eggs have convinced the fancier that it is his duty to endeavor to assist in retaining a portion of this wealth in America.

We find that Pennsylvania stands fifth on the list in point of value of eggs and poultry produced, with Illionis, Iowa, Ohio and Missouri leading, and it certainly is very important that the farmers of this State make a greater effort and have the Keystone State head the list when the time rolls around for the next census. Permit me to call your attention to what is being done at State College to further the poultry interests, and give to the younger generation who may be so fortunate as to be able to attend the new Agricultural end of the College, a far greater knowledge of this much neglected work.

At the last session of the Legislature \$2,500 was appropriated for the Pennsylvania State College Agricultural Experiment Station, for the construction of a tool-house and poultry houses. The Trustees of the College divided the appropriation equally between the tool-house and the poultry houses, that is \$1,250 to each.

At the Pennsylvania State College, the first poultry house consisted of a little building about 12 feet square with a board roof, that had been discarded by another department of the College, that had formally used this building as an observatory to protect star gazers in windy weather. Then for several years a small poultry plant, which satisfactorily accommodated five or six small pens of fowls, that were used for educational purposes. One of the most urgent needs was an incubator building wherein artificial incubation could be carried on in a satisfactory way. During the time that the poultry has been kept by the College for educational purposes, artificial incubation has been a most serious problem. Sometimes incubators were run in offices, sometimes in cellars, and one season for a time in an old cistern that was used for a root cellar. Later, however, it was found to be wholly impractical on account of insufficient ventilation. The other places for running incubators were opposed to by the Insurance Company, and finally artificial incubation was prohibited. Consequently, one of the greatest needs was an incubator building that would be sufficiently large to meet the requirements of the Experiment Station and sufficiently removed from other buildings to meet the requirements of the Insurance Companies.

A small brick building, 19 by 25 feet, having a hollow wall, cement floor, and steel ceiling has been constructed, which will undoubtedly meet the requirements, for the present at least.

In addition, two poultry houses have been constructed, each 12 by 20 feet and divided into two pens, each pen having a capacity of from 12 to 20 fowls, making in all winter houses that will accommodate from 150 to 160 fowls. The new poultry houses are furnished with scratching sheds and will be furnished with an adequate yard or run for each pen. Until the present time the Experiment Station has had no interest in the fowls maintained by the College, and no attempt has been made to use fowls in any extended way for experimentation, the poultry being maintained by the College wholly for educational purposes. Each year, both the four year students and the students in the Short Courses in Agriculture, have been given from 25 to 30 lectures covering the various phases of the poultry industry. During the time these lectures were given they have been supplemented by practical work in judging fowls, both by comparison and by means of the score card.

It is thought best to use the fowls that are now to be placed in charge of the Experiment Station for educational purposes as far as they may be used without interfering in any way with experiments that may be in progress.

It is hoped that in the near future some questions of incubation may be taken up for thorough and comprehensive investigation, which will involve not only close attention of the practical poultryman but of the competent Biologist. While aside from the many questions pertaining to incubation and the development of the various classes of fowls, it is thought that many experiments pertaining to breeding and feeding may be carried on at some time.

It is now proposed to begin series of experiments on some lines of poultry work that are of sufficient importance to warrant the expenditure of considerable time and sufficient money to properly conduct the investigation. One on the line of investigation, which will be taken up in the near future, possibly at once in the department, if possible, is the comparative development of the young of the various classes of fowls. It is to be hoped that several breeds of each class may be used, in order that the average may be taken as a fair representative of the class. These comparative developments are hoped to include not only total live weights, but the production of flesh and skeleton, both from the standpoint of total weight and economy of production.

We are sure that the work which is now made possible by the erection of the houses and yards already alluded to, are only the beginning of a work of vast importance to the poultry interests at large.

Another important experiment is being worked out within 25 miles of Philadelphia, one to the west and one to the south, by which it is proposed to keep and winter in open sheds facing the south, fowls in a working condition. One shed is 70 feet long by 12 feet wide; holding 70 chickens with no protection at all in front. The other shed is 150 feet long, same width; holding 200 hens with a hinged canvas windows, which is lowered at night. From both of these quarters the number of eggs gathered has been far above the average, and all the stock is strong and healthy. The winter, owing to the mild weather, has not as yet proven the advisability of so radical a

change, but should the theory work out as planned, the much disputed question of ventilation will have been quickly settled.

The rapid increase in the use of artificial methods has produced a large amount of fresh stock during the off-season, but the rapid increase in the population of the country, and especially the rapid growth of our large cities, has so increased the consumption and the demand that the increased production, together with the large tonnage put in the freezers every fall and marketed during the winter, has not decreased the price. The only effect has been to make the season of high prices somewhat shorter. The increased consumption has kept pace with the production, and with the settling up of the prairie lands and the cutting up of the large ranches, the possibility of low-priced beef and mutton has decreased, and there is little likelihood that we shall ever again see low-priced eggs and table poultry, or much change in the average run of prices for the different seasons of the year. We can, therefore, lay our plans for poultry raising on the basis of current conditions, with a reasonable assurance that these conditions will be maintained for an almost indefinite period.

Professor Watson has said: "It is a matter of common observation among stock breeders of the country that many farmers have been sorely disappointed when they have attempted to breed one or more of the improved breeds of live stock. While they perhaps purchased good animals as foundation stock, and undoubtedly would have succeeded had they bestowed the proper care, yet the fact was well fixed in their minds, that, if the improved breeds were better than the animals that they had formerly kept, they would prove better under the same conditions that their animals had been kept under for many years. The results showed that the improved animals did better for a time. There seemed to be a reserved power or tendency towards an increased yield of desirable products over that which the farmer had received in previous years. The next generation was less satisfactory, and each succeeding generation approached more nearly in production that of unimproved animals, until finally a stage of production was reached which would be maintained by the care and food that was bestowed. As the spring cannot rise higher than its source, neither can the productiveness of our fowls maintain a higher standard than the care and food bestowed upon them will maintain. The less energy the fowl bestows on self-preservation the more may it bestow on those products which men most desire.

Improved domestic stock, among which fowls may properly be classed, have aptly been compared to agricultural machinery or implements. In pioneer times the farmer used rough, rudely-fashioned implements that in the light of modern times would not be called efficient. They were heavy and clumsy and accomplished comparatively little good for the power expended to propel them. But, because they were strong and the soil was mellow, they answered his purpose. To-day the farmer must have, if he be a successful competitor in the markets of the world, machinery that is more complicated, more delicate of construction, but that will accomplish more for the power that is expended to propel it. There is not a harrow on the market to-day that is as strong and will withstand as much as the old-fashioned drag made from the crotch of a tree. Neither

is there a breed of improved stock which will endure the hardships that are required of the now existing wild forms; and yet, one hears hardihood talked of as a most desirable quality. We must not fail to distinguish between health and hardihood. Great hardihood necessarily means limited production; limited production means little or no profit. The most profitable animal machines are those which will consume and turn to good use the greatest amount of food and expend all their energies in producing desirable products. If this be true, is not the neglectful poultryman, who cares largely for plumage, a hindrance to the great poultry industry of the country? If neglect induces hardihood, then he who bestows the best care is tending to produce the most remunerative breed or race of fowls. Discomfort and economical productions are never closely associated. Improved care and food have ever been potent factors in the improvement of domesticated animals. It is a significant fact that all noted breeders have been skillful feeders. As care and food have so largely made the many useful breeds of which we may well be proud, so is it necessary to bestow equal care if improvement is to be maintained.

I am sure that every thoughtful poultryman desires to improve his stock. He knows that it is susceptible of improvement and that he can improve it if he but take the pains and bestow the necessary care. Whatever way we may eventually drift, I am sure that I voice the sentiment of every one present when I say that it is our desire to so care for our fowls that we may at least leave them as good as we found them.

The CHAIRMAN: The closing topic on our program for this evening is "Barn Ventilation," by H. E. Cook, of New York. We shall now be pleased to hear from Mr. Cook.

The SECRETARY: Mr. Chairman, I want to say, through the Chair, to Mr. Cook that you have the cream of the audience; you know they are the people who always stay until the end; these are the people who really want to know, so you must not conclude that it is not worth while to do your best.

The address of Mr. Cook was as follows:

BARN VENTILATION.

BY H. E. COOK, *Denmark, N. Y.*

I want to tell you a little experience I had that this small audience brings out, a number of years ago in my earlier institute experience. I was at an institute where the attendance was very small; I think perhaps there were a dozen in the room, there was a gentleman present who was very popular in our State, a member of our State Legislature, a man who had been instrumental in helping in the carrying out of our agricultural legislation. I was hesitating somewhat as to whether it would be worth while to go on, and he says, Young man, I want you to understand that I am just as much

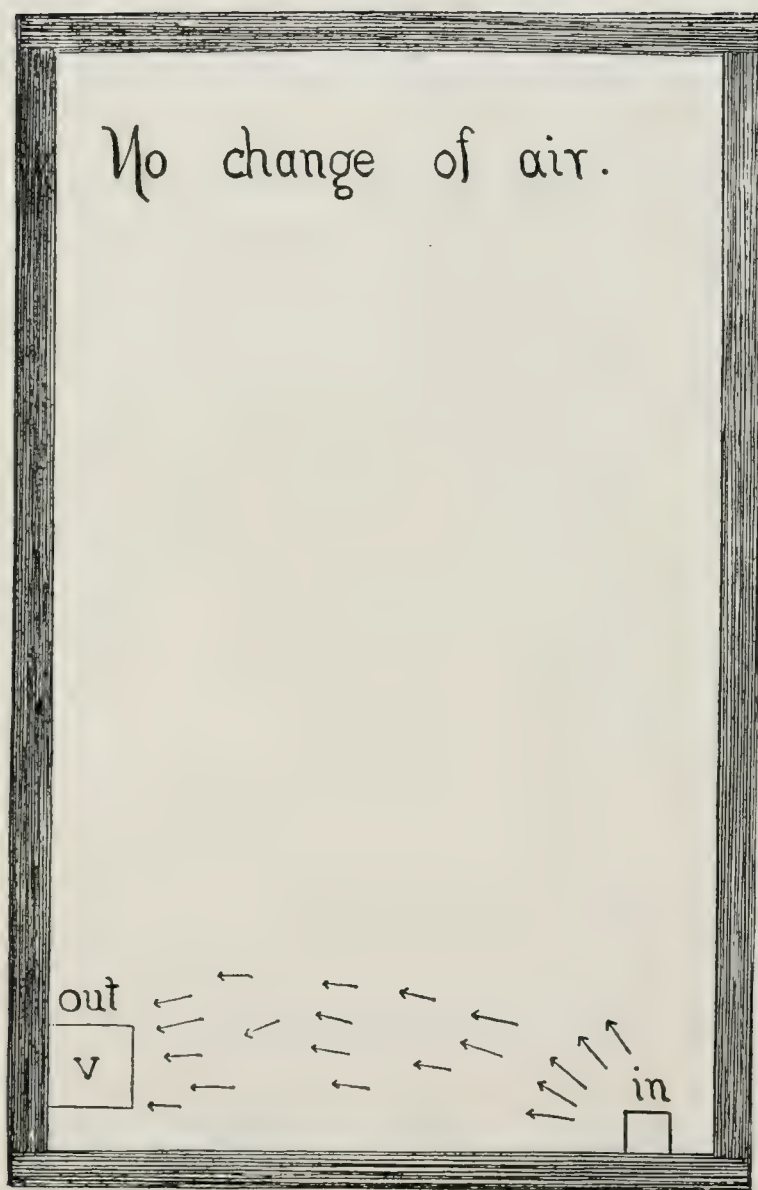


Fig. 1.—The wrong way to place the ventilation flues.

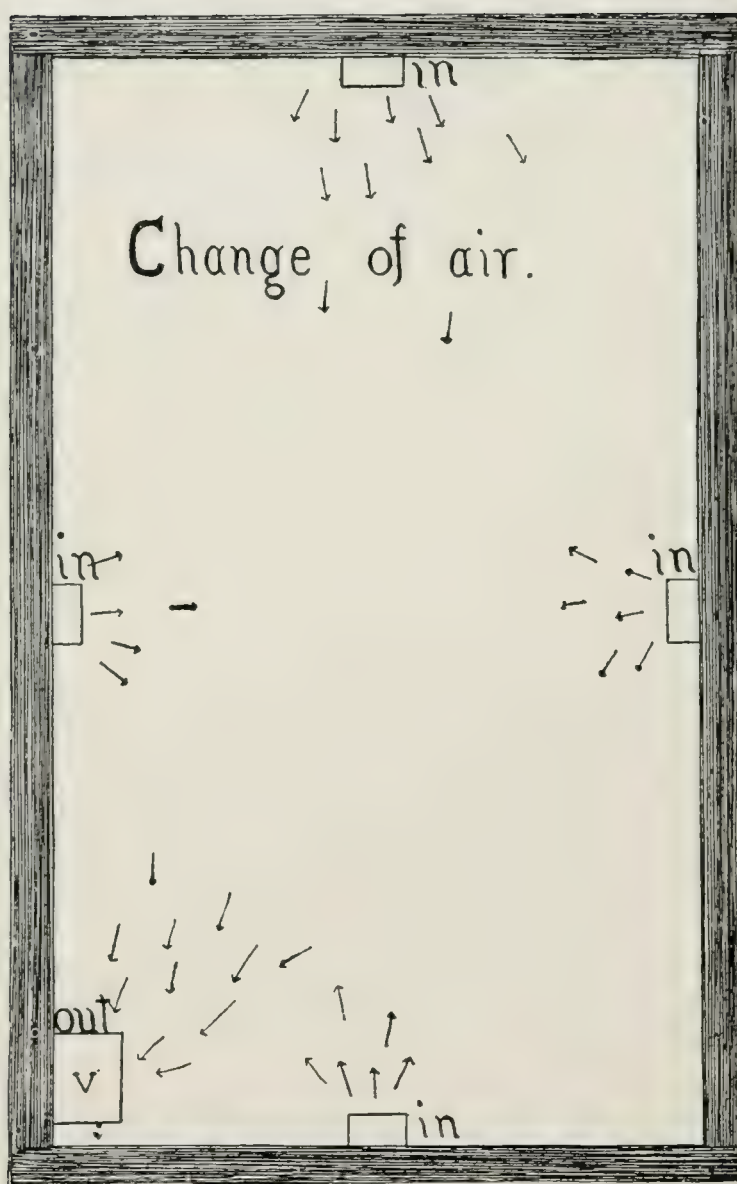


Fig. 2.—The right way to place the ventilation flues

entitled to this work as though the room was full." I never have forgotten it, and there never has a farmers institute gone by the board if there was one man present. I believe that is the right principle to work under.

Now I am taking it for granted that we have a room ready for the ventilating flues, unless there is some question that you would like to bring out; if there is any such question concerning the construction, let us have it now. I want you to understand that if the construction is not right, the flues won't work, and I could not guarantee for a moment that you would get satisfaction out of any system of ventilation which should fairly well control the temperature in that vicinity.

MR. FENSTERMAKER: Will they answer for some other kind of a tie besides the stanchions?

MR. COOK: Yes, I have provided here for almost any kind. (Referring to drawing on blackboard). This you will understand represents concrete work. The concrete work may perhaps have to be changed somewhat to meet the requirements of the case. I have seen buildings in pretty nearly every shape where mistakes have been made. Now we are going to take the air in through certain flues and going to throw it out through certain other flues. This means first that the flues through which the fresh air, the cold air from the outside comes in, must be thoroughly distributed around the room, or if not possible to do that, as far as they will go.

Now we will suppose that we have here a given amount of air which we will say is sufficient for the room, whatever the size might be. Don't you readily see that the currents of air would form in this shape (indicating) and that this great body or bulk of air in that room would hardly be changed. (See Fig. 1.) That seems easy, does it not, provided this room is tight. If we take the air out of this corner, and take the air out of the opposite corner, we will have not only foul air, but have a condensation of moisture there.

Now come over to this building (indicating on blackboard) and we will take the air in at these points. There is another proposition: Many men have made a mistake right there, especially if the barn had an L attached to it in this shape, and this was all in one stable or one room. They have not, some of them, realized that it was necessary to provide for the intake flues in that projection. (See Fig. 2.) No matter how small that is, it will be as necessary to provide for the intake flues in this space as anywhere else. I think that will dawn on you in a moment. In order to prevent condensation, it will be necessary to keep the air in circulation from this point of the room; the only way we can do this is from these intake flues.

A Member: How do you construct those?

MR. COOK: That is what I am going to tell you. I will put it on the board and I have a little model which I will show you as well. Now we want to build those so that they will work, and so that there will be no chance for them to work the wrong way. You have seen ventilating flues that were wrong side up; instead of the air going out, it came in, and vice versa. Now if these flues were built in this way, and carried on up a very little distance, within the ceiling of the

barn, and there opening the flues, they will always work. The question arises—I think it was Prof. Shaw who put the question—supposing the wind is blowing with strong pressure against this will not. I have watched that repeatedly. I will say this, that a gale blowing on the west side with the flues on the east side of the building it will remain more nearly neutral; that is, the circulation will be very much reduced, but I have never seen the time when the circulation was stopped, much less reversed, for the reason that when the cold air comes in contact through this flue with the warmer air inside of the building, the volume of air by the raising of the temperature is just slightly increased, and just the moment you increase the volume it rises; that is a simple proposition. You need have no fear if they are built at least three feet long. In many of these old barns, the wall is built up part way, and the space between the stalls and top of the ceiling may be only a few feet. The flues will work in this short space.

Now about the size of the flues. It will make some difference where you live, the lower the average temperature during the winter, the smaller one can build the intake flues. The warmer the average temperature, the larger they will have to be. In a section like this, in my judgment you would want to give the building as much intake air as you give it of out-take air. A square foot for five cows, both of intake and out-take surface that is safe, wherever you go. If you are in a locality where the barn is subject to sudden changes and strong winds, then I would have these intake flues under control with some sort of shut-off, so that you will be able to open and close them at will. It is much like a stove, if you put a sack over your chimney, you can open your draft and there won't be very much draft to the stove; if you shut off the out-take flues, you are bound to shut off to a considerable extent, the intake flues.

A Member: Where is the air admissible into the room through the intake flues?

MR. COOK: Very close to the ceiling—next to the ceiling. I might say there is a disposition, on account of a theory existing some years ago, that these intake flues should be made in the ceiling, admitting the air into the center of the room to do that and there were a good many barns built that way, but that surely is not necessary.

A Member: Does the air come in at the bottom?

MR. COOK: The air comes in at the bottom; the flue opens at the ceiling.

A Member: It comes in at the bottom and goes up the side.

MR. COOK: Yes.

The SECRETARY: The air comes into the flue at the bottom?

MR. COOK: Yes, on the outside, and is carried up and enters the room close to the ceiling.

A Member: I understand you to say that that flue should be about one foot square.

MR. COOK: I don't think you would need it a foot square. You will need to have a square foot of air for the five cows. I would not build them as big as that. I don't care how tropical you are. I would not build them as large as that, in my own case. Up there in Northern New York, we get a whole lot of fresh air through a pencil hole.

A Member: What do you mean by a square foot for five cows?

MR. COOK: Say we have a barn with five cows in it. Now we will put an intake flue on each side, and we will build that flue six inches square. That will give us a square foot, wouldn't it. It seems to me that ought to be clear. If we have five cows in this room, we will put in four intake flues six inches square, or six inches in diameter.

A Member: If you have twenty cows then, you will put in sixteen?

MR. COOK: No, I think not; I think I would begin to reduce then. There is a limit to the necessity of flues. We will say that we have a stable a hundred feet long; four intake flues in a hundred feet will do very efficient work; practically four flues in a hundred feet will give you very good work indeed.

MR. HERR: It strikes me that if there was a strong draft there, it would let in more than enough air for five cows.

MR. COOK: In my own case, it would, I am trying to adapt myself to your conditions. We are using about 75 per cent. of intake air as compared with the out-take. We have about three-quarters of intake air to the five cows and that is ample where I live; in our own case, the intake flues are always open.

MR. CLARK: If the wind pressure should be very heavy, would it not be found that there was apt to be a little draft on the cattle? Would you not find difficulty of that sort by adopting this plan.

MR. COOK: Where you are subject to that strong wind pressure, it will be necessary to have them under control, because in the milder days, without the large openings, you would not get fresh air enough.

MR. CLARK: We get fresh air by using a narrow window, and the window was opened at the top just as much as we saw proper.

MR. COOK: In many cases that can be done; in my own case the windows are double, and that of course prohibits the use of windows as intake flues in the winter time. Fix your windows so that they will open; say that this is the inside of the room, and then provide a half chute aside and a space to have two sides on this opening so that there will be an opportunity of the air coming in on each side.

PROF. VAN NORMAN: Why do you say it is unnecessary to conduct air over to the center of the room?

MR. COOK: Because I am satisfied that that fresh air will find its way to every part of the room. There is nothing to be gained by carrying the circulation into the room from there. I suppose if we had a building a hundred feet wide, it would be another proposition.

MR. CLARK: In the summer season, I suppose, the windows are all right?

MR. COOK: Yes.

A Member: If that flue is like that, would that answer every purpose if it was at the top?

MR. COOK: No—do you mean whether we could not use a space right directly through the side of the barn?

A Member: Yes.

MR. COOK: You can't do that because you would be up against the same proposition as with your window, your intake flues would serve as out-take flues on the one side of the barn, and the reverse on the other side. This system is absolutely automatic, only of course you will get a little more air when the wind is blowing than when it is not.

A Member: What would you build those flues out of?

MR. COOK: Anything you please. It will make no difference whether you build them of cement, iron, tiles or board.

Now let us see about the out-take flues. We want to keep in mind the working of the house chimney. We want to understand and go back again to the statement that I made this morning, that there are seven pounds of water in the form of vapor passing off from the animal every twenty-four hours. Now I would not, if I were you, concern myself with the carbonic acid gas in a barn. We want to get rid of it, surely, but if you get rid of the moisture, the carbonic acid gas will take care of itself. It is the moisture that troubles you. Now how shall we do that? In the first place it must be kept in the form of vapor in the stable, because after condensation it is too late; then you can't get rid of it. • It must be kept in the form of vapor until it goes out-doors. I suppose that the most of you have had trouble with the stove-pipe in your house. Well, if you havn't, you havn't had all the fun of house-keeping, and you have found that usually where the pipe enters the chimney, after running a long distance horizontally, or after it passed through a cold room, that something happened, either the pipe may have been so long that the current of air in the stove-pipe cooled off or had been condensed upon it, then of course the moisture in that pipe condensed. We have the same thing to deal with here, and the farther north you get the greater the problem is. The farther south you go, the smaller the problem is. Now I would not build these flues, even here, of iron, yet I know of a flue in New Jersey built of galvanized iron, but I do not believe it is a safe thing to advise. With us, we should be in trouble all winter if we did that—if we built the out-take flue with any kind of material that would radiate heat, so that I believe it is safer to build those flues in the cheapest way. The cheapest way is to set up a four by four scantling, and fill that four inch air space with straw. I do not know of any way by which you are so certain to get good flues for so little money. Board it up inside with matched lumber, and board it up on the outside and stuff that four inch air space with straw.

COL. WOODWARD: You have not indicated the size yet.

MR. COOK: Yes, a square foot of area for each five cows.

MR. McHENRY: It would not be any injury, would it, if built larger and filled with straw?

MR. COOK: Well, if I understand you right, the question arises whether there would be a chance of building them too big, getting too large a space; a four inch space will do the work—four inches of air space is sufficient. I thought you meant whether those flues can be built too large. That is a question. Do not build them too big, or you will be up against the same proposition that many have been in old fashioned houses provided with a fireplace and chimney as big as a house, and then they run a single stove-pipe into it and put in a small stove and fail to get the necessary draft. Why? Because the volume of air played tag, if you please, the cold air and the warm air, so there is such a thing as having these flues too big.

MR. HERR: Would there be sufficient draft with a four-inch flue?

The SECRETARY: The gentleman don't understand the construction of your flue.

Mr. Cook illustrated the construction of flues by a diagram which he drew upon the blackboard.

The SECRETARY: (Referring to diagram). That is the top of the flue now.

MR. COOK: That is a section. Here are your four by four scantling in the corner and here is your air chamber filled with straw.

A Member: How about filling it with sawdust?

MR. COOK: Dry sawdust would not be so bad.

MR. FENSTERMAKER: Chaff would be good.

MR. COOK: Good enough, yes. The trouble with sawdust is, it has a tendency, if there is any volume of it, to crowd the boards off, therefore, the lighter material is very much better.

The SECRETARY: The straw put in has a tendency to harbor mice and rats.

MR. COOK: Not with a cement floor.

A Member: How about shavings?

MR. COOK: Dry shavings would be better than sawdust; any dry material like that will do the work.

COL. WOODWARD: Do we understand that we are to pack that straw with some considerable solidity?

MR. COOK: Whole straw I would; with cut straw I would not. I think we have that question of the insulation of the flue pretty well in hand. Now where shall we put it? We lack in a way data on just how far a flue will work. If I can make myself understood—let us take this room. If we locate a flue at either end of this room, might we expect to get the service the whole length of the room? Now I believe this is a safe statement to make. That up to thirty cows in a building—take a building that holds thirty cows, and we

will give them about five hundred cubic feet of air space, and that will be all any dairy cow needs, in fact, she would be better off with less than with more. I would rather undertake to warm less than that, and supply fresh air often, than to warm more than that and reduce the current of air into the room. Five hundred cubic feet of air space is enough. That will be sufficient for each cow, where you have no more than thirty cows to supply. Now give her that, and putting no more than thirty cows into the room, I feel very sure that one flue will suffice. I am not sure but that it will do more; or you can divide the flues as you see in this model and carry it up half on each side. We can expect one set of flues like that for thirty cows to be ample. Now that would give us, you see, about two feet and a half square, or two flues 15 in. by 30 in. Your flue must always go to the highest point of the barn. If you have ever had any experience with boilers, running them up to their capacity, maybe you have found that your smokestack was not long enough. I have had that experience myself; I have a creamery located where trees have been planted fifty or sixty years, and I have had to go up above those trees or the current will work down, and interfere with the draft. Now we have the same proposition in this ventilating flue.

I visited a concrete barn recently where the out-take flues were short, projecting through the roof, and covered tight with a concrete cap. Small openings being left in the sides—of course the circulation was sluggish and the system a failure.

The SECRETARY: He didn't want the rain to get in, and the snow.

MR. COOK: To secure the circulation that he wanted—he should have carried those flues up through this concrete roof, as he could easily have done with a box, and left the box in there, and then come to the center, and gone up there about ten or twelve feet; that is what he will have to do. He will have to get both flues high enough to get the circulation.

COL. WOODWARD: We notice that your out-take flues have small apertures at the ceiling.

MR. COOK: These openings should be full size of the flue, and are used when the room is too warm. It may be necessary to use them all of the time.

There does not seem to be much doubt but the circulation could be all taken out above if we could thereby control temperatures. Some experiments conducted in New York tend to show that the purest air is near the floor.

In order to be on safe ground, let me say, use the upper flue openings, except when the temperatures run low then close them.

PROF. VAN NORMAN: Will a six-inch wall do it?

MR. COOK: Usually, it would, yes.

MR. CLARK: Do you believe that putting up this ventilation inside of a barn would be better than to take it from the center of the building?

MR. COOK: I do not believe it will make any difference so far as the air in the room is concerned whether the out-take flue is in

the middle or on both sides, or on the end of the room, because we have the same thing that we have with a big stove. It won't make any difference with an old fashioned big, box stove, which end the pipe is on, if the draft is in the other end, and that is really what we are dealing with. We are dealing with a big box stove, practically so. Now if the air currents are proportioned properly around this room, they are bound to find this out-take flue up to a certain length.

MR. McHENRY: In running that up to the side, how much above do you want the flue to extend?

MR. COOK: How high is the barn?

MR. McHENRY: Say, thirty feet.

MR. COOK: There is nothing in the way anywhere, no big trees nor anything of that sort?

MR. McHENRY: No, nothing in the way.

MR. COOK: Four or five feet will be ample above the ridge of the barn.

MR. McHENRY: Will the same thing hold good with the chimney?

MR. COOK: Yes, the principle is the same, but the problem is a harder one.

MR. McHENRY: As I understand it, this flue will need go higher than a chimney would under the same circumstances.

MR. COOK: Yes, and put a cover over the top of the flue and don't interfere with the current of air.

PROF. VAN NORMAN: How about putting a double door at the top of your flue, connected with a rod, so that when the wind blows on it, it will be possible to regulate it?

MR. COOK: One of the nicest theories that was ever promulgated, but it don't work in practice. I know of several barns constructed like that. We want to let everything absolutely alone on top of this flue, and let nature take its course right across the top. I would not do anything, only just to be sure that the top of that flue is up in good fresh air, with a cap over it to keep the rain out, and the trouble is over.

A Member: Must that cap be put on rods?

MR. COOK: Yes, take some small pieces of iron and set it up with half inch iron. You can build this flue—I did in my own case above the ridge of galvanized iron, because it looked much better than boards.

MR. HERR: You have to have the cap upon it on the four sides, or the top sides?

MR. COOK: Have it open out at the sides, just set it up above the flue. Have it open all the way around and sustain it there with a half inch iron rods.

A Member: In Pennsylvania we sometimes have these old fashioned bank barns. I think I understood you to say that it don't make any difference where we put that, in the center or in the sides of the barn, the flues should be perfectly straight.

MR. COOK: Yes, the straight flue does two things in most barns. In the first place, it interferes with the hay track, and in the next place it interferes with something down below. We either drive through there or go through to feed our cows.

I will tell you how you can make an adjustable flue for a barn like that. Let the flue come down solid to a point where it won't strike your head, and from there down, build the flue enough smaller so that it will telescope into the flue above. You can raise it or lower it. You can take your circulation from the floor, take it half way up or take it clear up from the ceiling. You don't need insulation down in the stable because the temperature of the air on the outside is the same as the temperature of the air on the inside.

A Member: Why couldn't that flue be utilized as a hay chute?

MR. COOK: It can be if the fellow that feeds the cows will shut the door; it certainly can be, but I have never dared to advise it, because one will go up in the hay mow and throw the hay down, and forget to shut it, and the next morning you will come out, and find frost on the roof in a cold morning and something will happen to the hinge, and that will stop the circulation and you come out there in the morning and everything seems kind of stuffy. So all things considered, I have not advised it.

The SECRETARY: Well, it wouldn't be large enough, would it?

MR. COOK: Yes, it might be. I was in a barn yesterday where it was right to an inch. Ordinarily I would not do that; I would have a separate piece of machinery.

A Member: I built a new barn four or five years ago, and we have used the hay chute for ventilation of the basement. Whether it is right or not, I am not decided, but I know that we get good results. The hay chute don't come outside of the roof; it comes up within three feet of the roof of that barn. It is forty feet from the barn floor to the cone of the roof, and we throw the stuff down at one end for the cows and at the other end for the horses. We have used this barn; this is the sixth winter. There is room in there for twenty head of cattle and thirty head of horses, and it is full now, and I have failed to detect any odor at anytime in going into that barn. I had Mr. Agee with me last June and I felt a good deal complimented by what he said about that barn. He looked particularly after the ventilation, and asked about whether there was any dampness or anything of that kind. I told him I never saw anything of the kind. When he went away he said that I had the second best barn that he had ever been in. We built that barn ourselves; we didn't have any architect or anything about it. We had a big barn right on this same ground, and we knew where we were short in the other barn, and we kept that in mind from start to finish. Our cattle and horses are healthy; we have never had a sick animal for the last six years.

MR. COOK: I will be very frank with you, my friend. If I thought that anything you have said would counteract anything I have said, I should regret very much that I had ever come to Harrisburg. At the same time I do not question that the ventilation you have got in your barn is fairly good, but I beg of you, if you are going to do a thing, do it right. It is so much better that you get this fresh air from out doors. I do not want to debate this question with this gentleman who is a good deal older than I am, but I do not want you to take his view point and leave mine out.

The SECRETARY: Isn't it possible if the air cools, that it would come down and vitiate the hay?

MR. COOK: That might be rather farfetched, because the condensation would probably take place, if it took place at all, in the upper part of the barn.

The SECRETARY: Wouldn't it come down in being condensed?

A Member: It gets out at the roof, don't you worry about that.

MR. COOK: I have worked at this thing for six years, harder than I ever worked on anything before. Here in my friend's case, there is no doubt one of those exceptions that sometimes occur, but do not do it; run it out through the roof, and do it right.

MR. HERR: The out-take flue is always close to the floor.

MR. COOK: Close to the floor and close to the ceiling.

MR. HERR: Does that center flue that you talk about—would that come down to the floor?

MR. COOK: Yes, that would come down to the floor above the cows and it would take the place of these little openings you see in these flues, which of course are opened and closed at will. All we do in our own barn is to open and close these upper flues, as may be required.

A Member: They are warm weather flues?

MR. COOK: Yes, warm weather flues.

A Member: When you open these warm weather flues, is your ventilation just as good?

MR. COOK: Most certainly it is.

I remember a cold day when the wind had just changed to the south, and the atmosphere was full of moisture without any air currents forming at all outdoors, and it was hard to get any currents to rise upwards. That was the day we held our meeting in this barn. We had four hundred people, in addition to fifty cows, and yet we were able to maintain this sort of a pure atmosphere. That was a pretty trying time to maintain pure air. We are able to carry a temperature of between fifty and sixty degrees; when it gets up to sixty, we blow off some of this air. I might tell you that in making some of the tests and in watching them very carefully we had a period when the temperature ranged from freezing to twenty degrees below zero, and we were able to keep the temperature

within a range of six degrees. I say that ordinarily, with the care it gets, we will keep the temperature within a range of about ten degrees.

MR. HERR: Without any artificial heat?

MR. COOK: Without any artificial heat. Now that is not an expensive proposition. It was at my request that these people came to our place where we held this institute. Some of the people didn't believe all I said, and I had to take them there and prove that I was not lying, and if any of you think what I have stated is not correct, if you will come up and examine it for yourselves, if you don't find it practically as I have said, I will pay your fare.

DR. FUNK: Would that system of ventilation answer for a fruit room?

MR. COOK: I do not think it would. I spent two weeks, Doctor, in the State of Maine this Fall working along this line, and when I reached Aroostook, that famous potato section, nearly every man came to me to know if there was not something in this system that would help them out. They have a problem of a peculiar sort there; I could not see after studying it very carefully, how it could be applied for this reason, they do not need such a change of air as this would bring about. They simply want to get rid of the moisture and keep as cool as they can. Now without artificial heat to let in these currents of cold air, we would soon let in so much cold air, that we would have a freezing temperature inside. They are building these potato houses in a bank, and building walls with an air chamber, and putting in two or three windows, simply for the purpose of cold storage, and laying a loose plank floor above, so that they can go in and take that up anywhere and dump down their potatoes, and after they get through, they put on anywhere from two to four feet of straw, and that moisture works itself up through the cracks and I think that the men who have done that have got the ideal system for their potato houses.

The SECRETARY: Do not forget to tell us about the meeting.

MR. COOK: I have that right here. Now we did this work as a starter. You will see the one picture represents the people being talked to, and the other being fed, or as having been fed, and I want to say there wasn't anything left after they got through eating because we had more people than were expected. Mr. Dawley, our Institute Director, held this meeting to show farmers how cheaply sanitary barns could be built and maintained. We can build along this line cheaply as well as to build expensively. There is no reason why any man producing milk should keep dairy cows who cannot keep a stable along this line, and I believe, Dr. Tower, it would help you in your work, because it is a question of health to the animal, and system of ventilation is really the key to the whole thing.

Now, Mr. Chairman, I believe I have talked as long as it is proper, and I want to thank the people very courteously for the kindness shown me since I came here. I realize that when you get a body like this together, you have the pick of the great Commonwealth of Pennsylvania, the best men that the State affords, and in

fact we have had one ex-Governor and the present Governor with us to-day, and I suppose a whole lot of men who want to be Governors. I am not sure whether that is so or not, but I am glad that the time has come when the man on the farm can look with longing eyes and expectant eyes to these positions of responsibility and I have longed for the time to come when the farmer could say that he knew as much about his business as a professional man knows about his business. Again thanking you people and you, Mr. Chairman and Mr. Secretary, I bid you good-bye.

On motion, duly seconded, a unanimous vote of thanks was returned to Mr. Cook for his excellent addresses.

MR. COOK: Mr. Chairman, I would like just to say that I believe I have never talked on the question of ventilation to an audience that I feel now has a better understanding of it than this. I have talked to people who I thought knew, but when I got through, they didn't; but I think this audience knows.

The SECRETARY: I thank you for the compliment in what you have said.

PROF. VAN NORMAN: These Pennsylvania Dutch barns with big banks and standing walls, is it possible to provide methods of ventilation that will overcome the difficulties in their case?

MR. COOK: Here is a very good way indeed; to get the intake flues into these so-called bank barns.

MR. COOK: Take away the dirt down to a point at least three feet from the stable ceiling, put down a box or flue on the outside, cut an opening through the wall and connect the inside flue through the outside. These flues will have to be fifty per cent. larger than where the side of barn is exposed, because we lose the effect of wind pressure.

MR. VAN NORMAN: Take the air into the bottom in that case?

MR. COOK: Take it in just the same; turn around and carry the flue up there (indicating on diagram).

A Member: Wouldn't it do just as well to put it in at either end?

MR. COOK: It will do fairly well if the barn is not too long and the flue—the out-take flue is on that side of the barn.

Now there is this bank here, this side is banked the whole length, and we do not want to put an intake flue in there; it would be better if you did, but there is a way that you can get out of it; put the intake flue right in that corner (indicating on diagram). Now put the intake flue right there; don't that strike you? Then we have got air currents forming right along next to this wall that will prevent condensation.

The SECRETARY: But you must remember, Professor, that that bank is on the ends, too.

MR. COOK: Then on the ends, I would dig down there.

DEPUTY SECRETARY MARTIN: When you go down, you want to put in both light and ventilation. You can put both light and ventilation there by digging away there, can you not?

MR. COOK: If you want to go to work and dig away there, yes, I think that would be very much better; you did not suggest that idea. Let me give you another way, if you want to sit just a moment. It will often determine when you walk into a stable whether the intakes and out-takes are well-balanced. Sometimes when you open the door into a stable, you notice at once that the air rushes out because you have pretty nearly compressed air inside. In that case it is easy to see that the out-take flues, if they are in there, they are not doing their work, or the air would not rush out when you open the door. On the other hand, I have been in stables where you would have to go in two or three feet before you would begin to feel the change of temperature—say the change from the outside was twenty degrees, you would not feel that until you have got into the barn several feet, because there was not fresh air enough coming in to provide the out-take flues with what they were called on to carry out; I can tell the whole story the minute I step into the stable.

DEPUTY SECRETARY MARTIN: And you often see a little steam coming out.

MR. COOK: Yes, that is wrong, anyway.

MR. NELSON: I am sure we would all like to have a word from Mr. Martin.

DEPUTY SECRETARY MARTIN: Mr. Chairman and Friends: You have indeed enjoyed a very rare opportunity at this meeting of the State Board, for there is no question or any one subject which is of greater importance to the dairymen of Pennsylvania than the question of the construction of the barns in which you keep your animals. The question of the old fashioned Pennsylvania barn has been mentioned several times during the last session. What you need in these old Pennsylvania barns, above everything else, is light and ventilation. I would commend to your careful consideration the lesson which you have received from Mr. Cook this evening. It is simple; it is plain; it is in line with the natural laws governing ventilation; it appeals to our common sense in every line to which our minds have been called this evening, and as we are in the midway of our farmers' institute season, I wish to call the special attention of the men who are engaged in giving instruction in Pennsylvania, to the lessons we have received along this line. This has been one of your opportunities, to procure a knowledge of the most approved method of barn ventilation, and I compliment you upon that important point.

Time would not permit nor would it be discreet that we should go over, to any extent, the valuable lessons that have been developed during this meeting. I know they will accomplish good results in Pennsylvania. The field here in Pennsylvania is a broad one and an important one, and the gentlemen who have come to us from other states have let us into lines of thought that will no doubt be a benefit to us, and I want to join my voice with that of yours this evening in expressing our gratitude and thanks to these men from other states, equipped as those men have been with knowledge of a practical kind, who have brought to us such excellent instruction during the sessions of this meeting.

COL. WOODWARD: Mr. Chairman, I am very well aware that this morning there was a sort of an "omnibus" vote of thanks given to all those who were here. This has been a special audience and has been a special treat. I do not believe I should sleep very well to-night if I should go home without personally expressing my admiration for the clearness with which this very difficult problem has been presented to-night, and I am going to move that there should be a special vote of thanks at this time—on this occasion and at this time for the most interesting, clear and lucid way in which Mr. Cook has solved these problems for us.

The motion having been seconded, it was unanimously agreed to.

DEPUTY SECRETARY MARTIN: Mr. Chairman, will you just permit a word before we adjourn. My mind was so absorbed with the excellent lesson to which we have listened to-night, that it drove out at the time, one other thought that was impressed upon me during this meeting, that your worthy Secretary of the Board and also Secretary of Agriculture, along with the members of the State Board of Pennsylvania, who are the county chairmen of institutes, are men qualified to present such papers of such a high order as have been presented at this meeting. Now I am proud of that, because I come in contact with these men steadily the year round, and if they were not present, there are some things that we would say that we will leave unsaid this evening.

MR. HERR: I move that when we adjourn, it be to meet subject to the call of the Secretary.

The motion having been duly seconded, it was agreed to.

The SECRETARY: I want to say that I have been so busy as not to be able to get around and know about your vouchers, but they will all be sent to you and you will receive the payment for your expenses very promptly.

MR. McHENRY: Mr. Chairman, it is a rule, I believe, always to keep the best for the last, and I would like to hear from our worthy Secretary before we leave here.

The SECRETARY: Mr. Chairman, it seems to me that we have had enough. I do not see how I can add anything to what has been said during this very excellent meeting, but I am certainly very much pleased indeed with the unusually large attendance and the interest that has been manifested during the sessions. I might say that in the preparation of the program, the thought that was in my mind was, to bring before you something that would be of most interest just at this time; subjects that are timely. The reason that we have had so much upon the live stock question, is because I have noticed, as I think you have all noticed, that there is an increasing interest all over this country in this question. There has been a very great advance made in the last two or three years, not only by our own State but by the whole country.

You may have observed that during the year just closed, that the amount of stock which was sold at the city of Chicago—and that may be regarded as a fair index of what is going on in the country, because that is the center of the live stock business—was about thirty-six and a half millions of dollars more in value than it did the year previous, and this was what brought me to consider that it was im-

portant for us to make this a special feature of this meeting; and so in looking around for men who could give us some information along these lines, my thought was directed toward Professor Shaw of Minnesota, knowing that he could tell us how to breed the stock, select the stock and feed the stock. Then the next thought was, I wanted somebody to tell us how to house the stock and take care of its health, and so I succeeded, and I was very glad—I have been especially glad since we have been together—that I was successful in getting these men to come here.

Now, I know that this meeting has been an inspiration to me, I know that I shall take up the regular routine work of the Department quite a good deal refreshed because I have had an opportunity of seeing you here, and because of the enthusiasm, the earnestness, and the intense interest that has been caused by the work that has been done, and because of the most excellent reports that have come from our standing committees and because of the character of the instruction that we have received from the gentlemen who have favored us with their presence from other states.

MR. BLYHOLDER: Mr. Chairman, we certainly have been gratified and have been instructed to a greater extent than we have ever been at any former meeting that I have ever attended. We have had, I think, one of the best meetings that we have ever had, and I think that we appreciate all that we have heard and have received.

We have given thanks to these gentlemen for the excellent work that has been done, but it seems to me that there is one thing that we have been pretty nearly forgetful of, and that is this: It has just been brought to our attention that somebody has been responsible for all this good work that has been done, somebody has been instrumental in affording us this excellent program, and that person is our worthy Secretary, who has prepared this feast for us and has delivered it to us, and I, therefore, move you, Mr. Chairman, that we, as a Board, extend to him our most hearty thanks for the able manner in which he has prepared and had this meeting conducted.

MR. McHENRY: Mr. Chairman, I second that motion and heartily support it; we were not forgetting it, we were only leaving the good things off for the last moment, that was all.

MR. BLYHOLDER: Mr. Chairman, I hope that the motion will be passed by a rising vote.

The question being put, the motion was unanimously agreed to, by a rising vote of all present.

MR. McCLELLAN: Mr. Chairman, I move that we do now adjourn.

MR. HERR: Mr. Chairman, I second the motion.

The question being, shall the motion prevail?

It was agreed to, whereupon the meeting adjourned, subject to the call of the Secretary.

N. B. CRITCHFIELD,
Secretary.

PROCEEDINGS

OF THE

FORTY-SEVENTH ANNUAL MEETING

OF THE

STATE HORTICULTURAL ASSOCIATION

OF

PENNSYLVANIA,

Held at Gettysburg, Pa., January 17-18, 1906.



PROCEEDINGS OF THE FORTY-SEVENTH ANNUAL MEETING
OF THE STATE HORTICULTURAL ASSOCIATION OF PENN-
SYLVANIA, HELD AT GETTYSBURG, PA., JANUARY 17-18,
1906.

OFFICERS FOR 1906.

PRESIDENT.

Gabriel Hiester,Harrisburg.

VICE PRESIDENTS.

Hon. W. T. Creasy,Catawissa.
Thos. B. Meehan,Germantown.
Dr. I. H. Mayer,Willow Street.

RECORDING SECRETARY.

Enos B. Engle,Waynesboro.

CORRESPONDING SECRETARY.

Wm. P. Brinton,Christiana.

TREASURER.

Edwin W. Thomas,King of Prussia.

Gettysburg, January 17, 1906.

An awakening interest in fruit growing in Adams county, fostered and encouraged by an active local organization, "The Fruit Growers' Association of Adams County," together with a varied and interesting program of practical speakers and horticulturists of acknowledged ability and reputation, combined to make this a most instructive and interesting occasion.

The display of fruit, although not so large as some exhibits at previous meetings, was unusually fine, and was an evidence of the growing interest that is being manifested in apple culture in Adams county.

As a full report of the different exhibits and exhibitors is given elsewhere in detail, no description will be attempted here.

The following life and annual members have joined the Association since our last meeting:

LIFE MEMBERS.

Gabriel Hiester, Harrisburg, Pa.
Ehrman B. Mitchell, Harrisburg, Pa.
Edward A. Woods, Pittsburg, Pa.

ANNUAL MEMBERS.

W. S. Adams, Aspers, Pa.
A. T. Baird, Island, Pa.
N. C. Beachy, Allentown, Pa.
R. G. Brooke, Schwenksville, Pa.
A. N. Brown, Wyoming, Del.
R. M. Cummings, Montandon, Pa.
Milton C. Dietz, Mechanicsburg, Pa.
Henry Eicholtz, Waynesboro, Pa.
Robt. M. Elden, Aspers, Pa.
D. M. Ellis, Bridgeport, Pa.
W. A. Freed, Homewood, Pa.
John D. Hait, Bryn Mawr, Pa.
John D. Herr, Millersville, Pa.
William Hummel, Bradford, Pa.
D. C. Kauffman, York, Pa.
T. C. Le Fevre, Harrisburg, Pa.
A. B. Lehman, Fayetteville, Pa.
R. W. McAllen, Fannettsburg, Pa.
N. G. Miller, Harrisburg, Pa.
Saml. C. Moon, Morrisville, Pa.
Mrs. Elizabeth D. Morton, Ingram, Pa.
J. E. Moudy, Littlestown, Pa.
Miss B. G. Pierce, 3300 Arch St., Philadelphia, Pa.
B. G. Pratt Co., 11 Broadway, New York, N. Y.
Dr. J. S. Rittenhouse, Lorane, Pa.
Albert Shorb, Hanover, Pa.
W. H. Swartwood, Falls, Pa.
Dr. S. Y. Thompson, Danville, Pa.
Edwin C. Tyson, Floradale, Pa.
Chester J. Tyson, Floradale, Pa.
Don Wallings, Clifton Heights, Pa.
A. I. Weidner, Arendtsville, Pa.

President Hiester called the Association to order, and after the usual routine of reading and approval of minutes of previous meeting, and a recess of five minutes for enrollment of members, the following letter of welcome was presented:

The Fruit Growers Association of Adams County,
Floradale, Pa., January 16, 1906.

To State Horticultural Association of Pennsylvania, in Convention Assembled, Gettysburg, Pa.:

Gentlemen: The Fruit Growers Association of Adams Co., Pa., extend to you a hearty welcome to Adams county.

We wish to assure you of our interest in your work and hope that the sessions of your Convention may be full of pleasure and profit.

Trusting that you may again see fit to meet within our midst, I have the honor to record myself, by order of this Association,

Very sincerely yours,

EDWIN C. TYSON,
Cor. Sec'y.

The President responded briefly, thanking the Adams County Fruit Growers' Association for their cordial welcome as well as their hearty aid and co-operation in awakening an interest in the work of the State organization.

As Chairman of Committee on Legislation, Mr. Hiester reported that an interview was held with the Governor on the question of creating a Division of Horticulture and Pomology in the Department of Agriculture, and that his excellency seemed to favor the enactment of such a law. In a subsequent interview his attitude on the subject seemed to have changed, and no further effort in that direction was made.

In the absence of Chairman Watts, the following report was read by Mr. McMillan:

REPORT OF THE GENERAL FRUIT COMMITTEE.

As Chairman of the General Fruit Committee, we want to thank all who have assisted in the furnishing of data for this report. Many who have contributed full notes are not members of the Horticultural Association, and we wish to express our special appreciation to these whose services have been of great value.

THE 1905 APPLE CROP.

The apple crop the past season was a signal failure in about nine-tenths of the counties. Adams, Dauphin, Lancaster, Franklin, Bucks and York are the only counties reporting satisfactory crops, and all of the correspondents in these counties do not report full yields. From 75 to 100 per cent. yields are generally reported from the foregoing named counties, although several growers report much smaller crops. No entirely favorable report is made by any one in the other counties of the State.

Wherever the yield was good there was very little complaint regarding quality. Summer and fall varieties seem to have been less generally a failure than winter sorts.

A great diversity of reasons are given for the failure of the 1905 apple crop. The destruction of blossoms by late frosts is the most frequently mentioned cause of failure. The light crop was attributed by many to over-bearing last year, 1905 being the "off year." Neglect and poor care are mentioned frequently and the San José Scale gets its full share of the blame. Unfavorable climatic conditions at various periods, too much rain for successful spraying, the lack of blossoms and prevalence of canker worms for the past two or three years, are also subjects of complaint.

In reply to the question: "Is the crop profitable in your county?" four-fifths of the correspondents give an affirmative answer, and those who answer negatively generally attribute the lack of financial success to the poor care of orchards,

Four out of every five reports claim that the old orchards are dying rapidly and the same proportionate number of correspondents claim that very few new apple orchards were established the past year. These are most encouraging facts to those who have planted largely in recent years and also to those contemplating entering the business on a commercial scale. There never was such a favorable time from a financial standpoint to start new apple orchards, and there need be no fear that the orchard will be too large, if proper varieties are selected and intelligent care given the trees. The San José Scale is the one great enemy that stands off the would-be planter, and the average tiller of the soil hesitates about planting on account of this pernicious pest, so that now is the opportunity for the skillful, confident fighters to plant trees by the thousand. Trees are dying and population is increasing, so that in all probability the markets of the future will require more fruit and pay better prices than in the past.

Several varieties of apples of comparatively recent introduction are mentioned as promising. Stayman's Winesap is evidently in the lead among the newer sorts. It has a number of enthusiastic advocates and judging from the data collected it is destined to be a great commercial apple. It is a winter apple, possessing many desirable points. It is a thrifty grower, coming into bearing early and yielding heavy crops of fruit of excellent flavor, highly colored when properly grown and of splendid keeping qualities. It has the reputation of being a more regular bearer than the Baldwin. Other varieties named as promising are Gano, Nero, Lankford, Stark, Walker's Beauty and Mammoth Black Twig.

As to the prevalent height of heading trees, there is a very wide range. In counties where apple culture is an important industry, as in Adams, York and Franklin counties, the trees are generally headed fairly low, say from three to four feet. But farmers and tillers of the soil who do not make a specialty of orcharding, head from five to ten feet from the ground so that teams can pass readily under the limbs without knocking off the San José Scale. The Lycoming county correspondent declares that the usual distance from the ground to the first limb is from ten to twelve feet. He is outdone by the correspondent from Montgomery county, who claims that fifteen feet is the prevalent height in his county. If the scale's favorite method of migration is walking it would have a long journey up the trunks of Montgomery county trees before finding good pasture.

PEARS.

The 1905 pear crop in this State was much below the average. The great majority of correspondents report a very small yield and no one a full crop except that the Kieffer in various localities, produced large yields. The President of our Association, Mr. Gabriel Hiester, reports that Lawrence gave a 10 per cent. yield, Bartlett 60 per cent., Seckel 75 per cent., and Kieffer 100 per cent. Nearly all correspondents state that the quality was poor or fair, while a number claim that the quality was good. In reply to the question, "What varieties are most profitable," Bartlett is decidedly in the lead, being favorably mentioned twice as often as Kieffer. This is encouraging to those endeavoring to produce quality instead of quan-

tity. A comparison with reports of previous years regarding most profitable varieties indicates that the Kieffer is not as popular as formerly among commercial growers. Clapp's Favorite and Seckel stand next to Bartlett and Kieffer as money makers.

As to whether pear culture is a profitable industry in Pennsylvania, seven-eighths of the correspondents take a negative position. One prominent pear grower blames the Kieffer for this state of affairs and this variety, no doubt, deserves much of the blame. Twig blight is really the greatest barrier to pear culture. No spray or application of any kind will prevent or remedy this disease and its control is very uncertain, so that growers hesitate about making large plantations. Of course much can be done to check or prevent its ravages by inducing only a moderate wood growth instead of a vigorous development of wood, and by removing and destroying infested parts as soon as discovered. The San José Scale is a serious but controllable menace to pear culture in our State.

PEACHES.

The 1905 peach crop was much more generally successful than either apples or pears. The majority of growers report excellent yields while some refer to the crop as large or very large. Failures and short yields of peaches were the exception rather than the rule. Conditions were quite generally favorable, although brown rot was very destructive in some sections. The failures reported were due to the winter-killing of fruit buds, spring frosts, San José Scale and the yellows.

There seems to be considerable fluctuation in the minds of our correspondents regarding the profits of peach culture. Only a year ago there was a decided negative declaration in reply to the question: "Is peach culture profitable in your county." This year nearly all the writers who attempt to answer the question assert that the business is profitable. Reports indicate that the ravages of the yellows are on the decrease and this is very encouraging to peach growers. The San José Scale is doubtless the greatest pest of our peach orchards.

PLUMS.

Only four growers report large yields of plums the past season. The majority of the reports indicate a very light crop over most of the State. Conditions were not generally favorable for this fruit. The curculio is the most destructive enemy, although the San José Scale is playing havoc with many trees. Severe winters, spring frosts, black knot, blights and rot are mentioned as serious obstacles to the business.

There is a great diversity of opinion as to the desirability of the Japanese plums. The weight of the testimony is in favor of this class, although a number of growers condemn them for commercial purposes. The European varieties are more certain of satisfactory results. Several new varieties are mentioned, but no particular sort seems to be receiving special attention. D. C. Young, of McKean county, mentions Sultan and Burbank as worthy of cultivation.

QUINCES.

The quince is of little commercial importance in our State. Three-fourths of the correspondents think the outlook for quince culture

is not encouraging. There is only a limited demand for the crop and most orchardists do not care to plant this fruit and give the care necessary to get satisfactory results. The blight is the most serious enemy.

CHERRIES.

Cherries are grown successfully in many counties of the State, and it is a profitable crop under favorable conditions. The mountainous counties afford the best conditions and the crop is very profitable in mountain localities affording good home markets. With suitable soils and climatic conditions the large sweet cherries of various classes are grown to perfection, while the sour cherries, as Early Richmond, are grown successfully over the entire State. Every possible attempt should be made on all farms, however, to grow cherries of the finest quality for home consumption. Montmorency Large, Montmorency Ordinary, Gov. Wood, Black Tartarian and Yellow Spanish are mentioned the most frequently, except Early Richmond, which is the leading sour cherry grown in the State.

GRAPES.

Grape culture in Pennsylvania is of little commercial importance, except in Erie county, where it is grown on an extensive scale. Although the crop is not largely cultivated for market purposes, nearly every farm in the State has a few vines to supply fruit for home consumption, and with this purpose in view it deserves special attention. It is grown successfully in every county, though soils and localities have much to do with the quality of their fruit. Black rot is doubtless the chief enemy, but the ravages of this disease can be prevented by thorough and intelligent spraying.

There should be a greater range in the selection of varieties for family purposes. Concord is planted more extensively than all other varieties combined, and this is a mistake when the object is to supply fruit for the home. We have no objection to file against the Concord as a market variety, but grapes of better quality should be more largely grown to meet the demands of the farmers' family. Concord is always reliable, and it should be planted on every farm, but not to the exclusion of grapes of superior merit. There should also be earlier and later ripening grapes than the Concord planted for family use. The following list of varieties might be suggested for planting in the family vineyard: Moore's Early, Campbell's Early, Worden, Concord, Niagara, Brilliant, Brighton, Delaware and Catawba.

SMALL FRUITS.

In reply to the question: "What varieties of strawberries pay best," twenty-five kinds are named. Bubach receives favorable mention the most frequently. In addition to Bubach, the following varieties are held in the highest esteem by our correspondents: Haverland, Sample, Clyde, Glen Mary, Wm. Belt, Gandy, Brandywine and Sharpless.

Cuthbert is very much in the lead as the best paying raspberry.

This report agrees with the report made last year, that the red raspberries are more profitable in our State than the black caps, although many prefer the latter class for commercial culture. Gregg and Kansas are the most popular black caps.

Snyder blackberry is the leader for commercial purposes. Kittatinny, Erie, Eldorado, Early Harvest and Briton are named as profitable varieties. The cultivation of small fruits is on the decrease instead of an increase, if reports indicate the present state of this industry. This is a lamentable fact when we consider the excellent markets of our State. Western Pennsylvania is particularly blessed with fine markets for all kinds of small fruits, but the markets are mostly supplied with berries shipped from other states.

VEGETABLES.

There are numerous enemies to the production of various classes of vegetables, yet most of these pests may be controlled by spraying or by other means. The market gardeners of the State have no serious menace to contend with, such as the San José Scale is to the fruit industry. A long list of vegetables are designated as profitable whenever market conditions are favorable. The potato is the most generally grown and is universally regarded as a profitable crop, yet many of our markets are mostly supplied by other states. This is a serious mistake of Pennsylvania farmers. Thousands of acres of land in the State are well adapted to potato culture and there is no good reason why we should not produce a much larger quantity of this standard vegetable. Immense quantities of early and late cabbages are shipped into the State, notwithstanding the fact that this vegetable is easily grown in every county and does not require the special physical conditions of soil that many other vegetables do. The markets in the western part of the State consume thousands of tons of cabbage, practically all shipped from other states, and which could readily be produced in this section of the State. There are many splendid opportunities to grow early tomatoes for home markets as well as many other kinds of vegetables as onions, celery, sweet corn, beets, lettuce, etc. There is need of a great awakening of the farmers of the State as to their opportunities for growing and marketing all kinds of garden crops.

SPRAYING.

Three-fourths of the correspondents report that spraying is on the increase and that when the work is performed in a thorough and intelligent manner the results are nearly always satisfactory. This is one of the strongest evidences of horticultural progress in our State. Spraying is now regarded as an essential operation in orcharding, just as important as pruning, fertilizing and cultivating.

THE SAN JOSE SCALE.

The San José Scale is the most popular insect in Pennsylvania. It is a favorite subject for discussion in the agricultural papers, at farmers institutes and at horticultural meetings. Nearly all correspondents report its presence in their respective counties and its ravages are universally feared. Great losses have already been sustained and a number of growers believe that its destructive work will be much more noticeable during the next two or three years. Thousands of trees have been killed and many more thousands are so badly infested that it is simply a question of time until the trees must succumb unless effectually sprayed before the advent of warm

weather, when the work of destruction will continue with increased force.

Commercial growers are protecting their trees by spraying, generally with lime, salt and sulphur and the results have been, as a rule, very effective in controlling the scale. But the great mass of tree owners are doing nothing to check the ravages of the scale and a vast majority of farmers do not know the scale, to say nothing of preventing its ravages. It is believed that the educational work being done by Prof. Surface and his co-laborers will be highly effective in encouraging a general warfare against the scale. It is purely a work of education, and while Prof. Surface is teaching the people what the scale is and how to kill it, every possible means should be employed to emphasize the value and importance of a full line of fruit trees on our farms, to furnish an abundant supply of fruit for home consumption if not for market purposes. We hope the time will never come when fruit culture will be limited entirely to commercial growers who will furnish general farmers with all the fruits they need for family use.

FERTILIZERS.

The use of commercial fertilizers is practically limited to specialists or those growing fruits and vegetables on a large scale. It is very rarely that fertilizers of any kind, except barnyard manure, is applied to the farm orchards of the State. The fertilizer usually employed by Mr. Gabriel Hiester, President of this Association, contains about 6 per cent. phosphoric acid and 14 per cent. potash. Mr. Snively of Lebanon uses a mixture containing 300 pounds muriate of potash, 400 pounds 14 per cent. rock phosphate and 300 pounds of steamed bone. When crimson clover or other legumes are grown successfully as cover crops, sowing about mid-summer, there is little or no necessity for using nitrogen in any form or even the application of barnyard manure.

TILLAGE.

Orchard tillage is not generally practiced except by commercial growers. The benefits of tillage, especially in the early development of the trees, is conceded by all. A favorite practice in bearing orchards is to cultivate at frequent intervals until about mid-summer, then sow cover crops, preferably legumes, as crimson clover or cow peas which are plowed under the following spring and the ground harrowed until time to sow the cover crop again. An excellent plan for the young orchard is to grow vegetables or small fruits between the trees, using fertilizers liberally so that the trees do not suffer from an insufficient supply of plant food.

SCHOOLS.

There is room for great improvement in the rural schools of the State, particularly in their relation to country life. Nature study receives more attention than formerly, but the work is not usually conducted in an intelligent and enthusiastic manner. The fact is that a large percentage of our country school teachers are not in sympathy with the work and life of our farmers, and when this is the case we cannot expect them to stimulate in the minds of the children any real interest in the great wonders of nature. Elementary agriculture is not taught at all, or not enough to be worth men-

tioning. The school grounds are seldom planted in a tasteful manner and receive little care. These conditions are not right and it is hoped that the Pennsylvania Horticultural Association and all kindred societies of the State will do their utmost for the improvement of our country schools. While many other states are enacting laws relating to the teaching of nature study and elementary agriculture in their schools, Pennsylvania is absolutely inactive along these lines.

THE GREAT NEED OF PENNSYLVANIA HORTICULTURE.

There is a great range of opinions covering this question and some of the needs as expressed by our correspondents are as follows: "Education," "better teachers in the country schools," "how to spray and eradicate the San José Scale," "thoroughness in horticultural operations," "brains," "vim," "brains and perseverance," "intelligent, enthusiastic men to engage in the business," "intelligence and grit," "a general awakening to the fact that careful attention will produce profitable results," "a suitable school curriculum." Most of the correspondents believe that education is the greatest need. Mr. D. C. Young, of McKean county, says the greatest need is "some Moses to lead us out of the wilderness."

R. L. WATTS,

Chairman General Fruit Committee.

The following "sub reports" are submitted for publication as containing much valuable and practical information.

R. L. W.

AUSTIN WRIGHT, Bedford Co.—The general outlook for extensive orcharding has not been as good as in the past few years, partly on account of the presence of scale in many localities where it was not suspected to exist. Orchardists, and the home planter are awakening to the destructive aspects of the future spread of scale and other pests and diseases, and a general education of the people by authority of the State is expected to show good results in the near future. We have not had any experience in testing new fruits in this county except by a very few planters who have not yet arrived at definite conclusions as to merits or demerits of some new creations.

THEODORE DAY, Wayne Co.—One reason why we have had three years of full apple crops, and in some orchards a fourth full crop, is the absence of leaf-eating caterpillars and worms. I knew a disease destroyed the May feeding tent caterpillars over 40 years ago, and again some 20 years later, and found the same disease working in a small orchard in Columbia county, and learned to spread it, and saw the destruction of those caterpillars for miles. Fall web worms that were extremely abundant there, also disappeared like magic; and a trip out that way last fall showed me that a worm that built the most complete and perfect tent of all, on scrub oak, had also disappeared. I had this disease introduced in three townships in this county, and in one place I placed it myself where forest space worms were eating vast quantities of leaves, with the result that they too have gone the same way. I saw a large colony of them the past summer dead and dying of the same caterpillar disease. These worms

build no tent, but let themselves down by a web or thread. I wish to try, with a little help from others, to spread this disease next summer, where such worms are getting destructive, and also learn if it will destroy a few other kinds of leaf-eating insects, that spin webs for any purpose.

D. C. YOUNG, McKean Co.—The past two winters in this county have been something frightful. Two years ago we had exceedingly cold weather and many of the apple trees were injured and nearly all the pear trees were killed. Last winter was very cold and steady and nearly completed the work on orchards done the year before. I think they might have withstood the winter, but in May we had two or three very hard freezes just as the trees were beginning to blossom. The blossoms were nearly all killed and many of the leaves were killed and the trees did not put forth new leaves. Hundreds of trees have been cut down during the past year in this county, and if we have another winter like the past two, apple growing will be a thing of the past so far as McKean county is concerned. Heretofore it has been very profitable and the fruit has been of very fine quality. Pears have also been a profitable crop, but until new trees are planted and commence to bear we shall have no pears here.

The common sour cherries have done well and the winters did not seem to injure the trees. Fine strawberries are grown here and the flavor the best I have ever seen any place. The winter seems to have no effect on the strawberry plants. Raspberries and blackberries are not cultivated as wild ones grow here in profusion and there would be no sale for the cultivated berries. Currants do well here and if hellebore is used on the bushes, and kept free of worms, the crop of currants is always very good. Where Bordeaux Mixture has been used in spraying, especially upon potato vines, it has been very successful. In fact, it is almost necessary to use it in order to get a paying crop of potatoes.

We raise fine vegetables in this county, and of excellent flavor. In fact, have never seen nicer celery grown in any place than we get in our own gardens here.

GABRIEL HIESTER, Dauphin Co.—Your questions cover the ground so thoroughly that I have nothing to add. We have no commercial fruit growers in the county, except Mr. Simon and myself. Owing to the wet weather in June the leaf blight fungus got a hold on the foliage of the apple trees and neither liquid nor dust spray could dislodge it after it cleared up. So the apple trees lost their foliage prematurely, which left the fall apple smaller than usual and lacking in flavor. York Imperial seemed to be more resistant, and the foliage remained green until frost and the apples were fine. The trees were loaded to the ground.

J. NEWTON GLOVER, Union Co.—We had too much rain when cherries were ripe for them to keep. Either wet weather or blight caused plums and peaches to dry on trees before they were ripe. On peaches it was due in part to the yellows.

This is not a great fruit growing county, except for peach orchards of which a number have been planted on the thin soil, where they do well.

W. H. STOUT, Schuylkill Co.—The season was not favorable for fruit, apples yielded so heavy in 1904 that the trees did not produce many buds and a frost at blossoming time destroyed much of the bloom.

Scale is playing havoc with peaches particularly and is spreading at an alarming rate, many have it and are not aware of it, until pointed out.

We had an unusual wet season after June, so that rot and fungoids were prevalent, causing fruit rot, and potato blight, and the ground was evidently too wet for the potato beetle to pupate so none were seen this fall after about August, so there appears a compensating gain with losses sustained.

Field crops, excepting clover, were good throughout; corn the best in years.

There are very few apple orchards treated with any care, grain crops being grown, little attention given to care and cultivation, the rotation of grass, corn, oats and wheat being continued sometimes manured, and a few hundred pounds of 1-8-3 applied with grain. The result is moss covered, declining trees with dead branches and once in a great while a crop of inferior fruit.

The boom in peach tree planting with 6 or 8 years has exhausted itself and not many engage in it now, most experiments proving failures. To plant trees and trust in the Lord does not meet with success in fruit growing.

J. Q. ATKINSON, Montgomery Co.—My impression is that those who can successfully control the San José Scale will, in the near future, reap a rich reward for their labors in fruit growing. The lime, sulphur and salt mixture will destroy all scales covered by it. Careless spraying has been the chief cause of failure. There is no occasion to boil the mixture. Lime should be fresh, slaked with boiling water, kept covered and stirred and allowed to stand one and one-half hours. The liquid will then be precisely the same as if boiled, and thus saving one-half of time and fuel. Unless a remedy appears and is applied, or some unforeseen change appears in conditions, all fruit trees will succumb to the pest, and in a short time. No new orchards are being planted in this county. There is not very much blight of late.

H. C. SNAVELY, Lebanon Co.—I combatted the San José Scale for three or four years, and by spraying trees carefully with the lime-sulphur-salt mixture, the pest can be held under control so that trees show vigor and produce good fruit.

Four years ago when I was abed and trees were not sprayed I lost a number of peach trees. Last spring we failed to spray all of the apple orchard because of a failure of force pump to reach me sooner and the forwardness of the season. Well, for results; where the orchard was sprayed the fruit was uniformly fine and the trees vigorous with healthy foilage. The unsprayed part, on the whole, brought a lot of fruit inferior in different degrees from fair to worthless, and trees in rather bad condition, due to the ravages of the scale louse. All these trees were sprayed in 1904, but the past summer seems to have been very favorable for the increase of the insect, more so than ever before. The best we can expect to do under existing conditions is to hold the pest under control.

So long as birds fly, winds blow and insects crawl, reinfestation is only a matter of time, unless all trees, shrubs and plants are so thoroughly treated that all the lice are destroyed. Thorough work will accomplish this and with the lime-sulphur-salt, but very few aim at thoroughness, while the majority do nothing until the scale and tree die together.

As to the use of so-called commercial fertilizers, would say I depend on them altogether, in connection with crimson clover.

The fertilizer used, consisting of 300 pounds muriate potash, 400 pounds rock phosphate and 300 pounds steamed bone, is for healthy, thrifty trees. Where growth is deficient more nitrogen must be used. For orchard work I regard nitrate of soda too soluble. Tankage is preferred, except where peaches or plums show a lack and promise a heavy yield.

A bearing tree should be fed for bud and fruit production, therefore judgment should be used in the application of too highly nitrogenous fertilizers. I think I must drop the crimson clover for a year or more in my peach orchards. The trees make too much wood. Sometimes as much as five feet. This is entirely too much.

For potatoes and small fruits I prefer the potash in the form of sulphate of potash.

Had the finest potato crop I ever raised. Eight acres of Carmen No. 3 made 2,000 bushels and nearly all marketable, a few too small and some too big.

Relative to saving the plums from rot when it rained almost constantly, would say that by keeping foliage, bark and fruit as much as possible covered with Bordeaux carries the crop through to maturity. This applies only to the domestica, for the Japan will not stand full strength Bordeaux. I mean the foliage, for it is as susceptible as the peach foliage.

The plum skin is smooth and sheds the Bordeaux at every rain, but this is not so material, for if the spores on foliage and bark are killed rot can be controlled. I might add though that this is not true of all plums. The Lombard will rot, spite of all I could do. The Gages are hard to mature.

I think this is a good time to plant all kinds of fruit trees, if the planter will observe a few things. First the adaptation of his land for fruit; second the selection of good varieties adapted to his locality; third, sufficient knowledge of the wants of trees as to cultivation and feeding; and lastly pluck to fight the fungous and insect foes that infest fruit trees and the fruit.

P. S. FENSTERMAKER, Lehigh Co.—I do not believe there are a half dozen persons in this county who understand the care of fruit trees in all its details. In the southern or southeast portion of our county there have been for ten or more years many many acres of fruit put out, principally peaches, and for a time large quantities of fine fruit was profitably grown, but since the necessity of spraying has become apparent, and of which they have very little knowledge and still less experience, there has been less interest of late shown in this branch. This is a very busy manufacturing section and cannot but prove to be a very profitable field for an up to date fruit grower and trucker. Thousands of dollars worth of fruit and truck are brought here in car loads, most of which could be grown right

here in what is the best soil in the world. There are five wholesale dealers in this city, who do nothing but ship in this section fruit and truck which they sell to retailers. They each have from four to twelve teams continually delivering goods. What little fruit and truck that is raised here is grown by farmers and mostly sold to consumers and generally of inferior quality.

The CHAIR.—The report just read is now before the society for discussion. I would like to hear from our members on the subject of agricultural education.

MR. HARTMAN.—I consider this one of the most important subjects before the people today. The reason boys leave the farm is not far to seek. Only the branches necessary to a commercial education are usually taught, and boys are allowed to think farming a very slow institution. There are many solved and unsolved mysteries on the farm, and our schools should bring out the relation it bears to human affairs.

* I would like the views of our members as to whether a young orchard is the proper place to grow small fruits.

The PRESIDENT.—I grew strawberries and raspberries in the orchard for about fifteen years, and do not think I could have put the ground to better use. The trees seemed to grow just as well and I do not think they sustained a particle of injury.

MR. BROWN.—It is the custom in Delaware to plant young peach orchards in berries, though we prefer not to plant on the tree rows, so as to save moisture. We usually fruit strawberries but one year. I am surprised to see Cuthbert raspberry so highly recommended in Pennsylvania. It is out of date on the Peninsula, and has been superseded by Miller, which is far superior in every respect. I do not like to see grain crops grown in young orchards as I frequently do in Pennsylvania.

MR. HARTMAN.—The quality of "Miller" is poor on my premises. My most profitable raspberry is "Turner" but it is rather soft for distant market.

MR. SWARTWOOD.—Cuthbert is the leading raspberry in Wyoming county. We have some trouble in procuring pickers.

MR. PACKARD.—I am sorry to see the question of agriculture in our schools lost sight of in these discussions. About three-fourths of the value of our exports to foreign countries is from our farms, and in this country will be fought out the problem and salvation of our rural homes.

MR. MOUDY.—I have an orchard of about 900 trees and have made \$40.00 per acre in growing canteloupes between the rows. Best not to cultivate too near the trees to avoid bringing the feeding roots too near the surface.

MR. HARTMAN.—The report just read stated that grapes are not generally grown except in Erie county. I planted about 100 vines several years ago and hope to find a profitable market.

MR. HIESTER.—Years ago many grapes were grown in Lancaster and York counties, but owing to Black-rot the vineyards were destroyed.

MR. BROWN.—Before leaving the discussion of this report of the General Fruit Committee, I want to commend it for its thoroughness and the valuable information that has been compiled from every section of the State. The first of the reports I ever heard was submitted by Mr. Snively of Lebanon, and was read at your annual meeting at Harrisburg, nine years ago, and it was one of the best I have ever listened to.

MR. HIESTER.—I heartily agree with Mr. Brown. I consider these reports better and fuller than any heard elsewhere or in any other state.

We have about completed our regular program, and I will call upon Mr. Tyson for some information concerning the local society that has been organized in this county and of which he is an active member.

The following paper was read by Mr. Tyson:

THE FRUIT GROWERS' ASSOCIATION OF ADAMS COUNTY.

A Logical Outcome of the Fruit Growing Interests of the Community.

BY CHESTER J. TYSON, *Floradale, Pa.*

Adams county, Penna., is bordered on the North and West by the South Mountain whose spurs and foot-hills break the adjoining county into numerous valleys with their well-drained, fertile slopes and interlying table lands. This comparatively narrow belt of land, with a few exceptions, comprises the fruit area of Adams county, varying from about three to ten miles in width and extending from York county to the Maryland line.

The soil of this district is quite varied; alternately and in some parts all jumbled together, we find red shale, gray and white flint, copper and iron stone. But whatever the soil, the hills are for the most part gravelly and the drainage is excellent.

For many years it has been known that this section was well suited to the growing of fruits, particularly apples and many fine old orchards have borne excellent fruit, doing their life work and passing away, to be replaced by others. Thus it has been for the past hundred years, but it was the same old story—a few fine apples, but not enough to attract the buyers. The volume of business was not here. Each grower was compelled to market his own fruit and through inexperience there was much loss. So the fruit industry did not grow. Early in the nineties, however, there was a general awakening all along the line and several large orchards were planted. From that time on, the enthusiasm increased, perhaps reaching its

height about 1900. I say its height, for about that time or a little earlier the San José Scale struck us and while the planting has continued, the timid ones have dropped out and it has been less general.

A census of the best known orchards of the district, taken nearly two years ago, shows over 40,000 apple trees and nearly 26,000 peach. This means to-day not less than 50,000 apple for the district and fully 30,000 peach. Of the apple fully 75 per cent. are York Imperial. Other varieties are York Stripe, Ben Davis, Baldwin, Stark, Rome Beauty, a few Grimes' Golden and many others. In the past year, some growers have top-grafted and planted quite largely to Stayman Winesap, but so far as I know, none have been fruited in this county.

Before passing, I want to say a word for the York Imperial. In a meeting of this kind we hear our old friend abused almost from start to finish. He is our first love, he is our money maker, and it hurts our feelings to hear him slandered and abused. Moreover, I want to say right here that the man who classes York Imperial with Ben Davis never has eaten a well-colored, fully ripened York Imperial from the hills of old Adams, nor has he tasted York Imperials cooked as our Adams county wives can cook them; baked whole, the core removed, the cavity filled with sugar and a good sized lump of butter on the top, fit for the table of a king; stewed Yorks, the quarters whole and firm, yet perfectly tender and with a richness peculiar to the variety—better than canned peaches any day.

For the past ten or twelve years, buyers have been coming after our fruit and we now have a cash market for our apples right at home. Heretofore the peach crops have not been large, but if the trees that are now planted come into successful bearing, the peach buyer will be with us also. Our apples are becoming known in many markets and the past season buyers were sent here from Chicago especially for our York Imperials, to fill a demand that has grown up in that city. In this connection, the following figures for the season of 1905 may be of interest: Apples shipped from Adams county in barrels, 25,997 barrels; in bulk, 11,228 barrels; total shipped, 37,225 barrels. Apples sold to evaporator, 10,670 barrels; to canning house, 2,400 barrels; together, 13,070 barrels, making a total sold in 1905 of 50,295 barrels, not counting the thousand of bushels made into cider. So much for the district and its products.

For the first few years we struggled along, each grower for himself; each one, except for occasional neighbourly advice fighting his own battles. But finally discouraged by the ravages of the San José Scale and by the heavy tolls levied from our crops by codling moth and many fungus troubles, fully realizing our individual weakness and the strength that united counsel and effort would bring to us, a meeting of the growers was called and on December 18th, 1903, was organized "The Fruit Growers' Association of Adams County." This organization has for its object the encouragement of co-operation among fruit growers for the protection and advancement of their common interests.

Our work so far, has been for the most part along educational lines, and we who have been privileged to attend the meetings each month feel that much real good has come out of them. We are fully alive to the danger accompanying the presence of San José Scale in our orchards and few meetings pass without some discussion of ways and means for holding this pest in check. A few members of our

Association have done some buying in a co-operative way and we are looking forward to the time when the organization may both buy and sell for the benefit of its members. It is our hope that through uniformity of package and strictest honesty in packing, the brand of our Association may become known and sought for in the markets of the world.

Our membership now numbers nearly eighty and we have started into the new year with the determination to make it one hundred.

In December, just past, occurred our first annual convention, a three day meeting, addressed by prominent scientific and practical men from our own and neighboring states. These men left with us many rich bits of advice and experience and their work was highly appreciated.

Our regular monthly meetings are held in the borough of Bendersville, on the second Saturday of each month and we shall always be more than glad to have anyone interested in fruit—be they producer or consumer—to meet with us and join in an exchange of views and experiences.

It is our earnest wish that fruit growers all other the State may visit us and that they may see in our work that which will encourage them to form, in their home communities, other Associations along similar lines. Let us go still farther and hope that some day these county associations may be brought together into a strong co-operative State organization and when that day comes, may we not also hope that the State Horticultural Society of Penna. shall form the foundation and center about which we may gather and build.

DR. KOONS.—I think the idea of organizing county societies and making them contributory to State organization, a very good one. This is a small gathering for a State society, and its membership and usefulness should be greatly extended by the organization of county and local societies in every county in the State.

PROF. SURFACE.—It has been well said that this is a small representation, for a State society, but withal there are many counties represented. This means that the gospel of good news will be carried to many homes, and become widely disseminated. Such organizations present many advantages to the fruit grower, one of the most important of which is buying and selling co-operatively, a matter of great importance. If horticultural or fruit grower's societies were organized in every county, meetings could be so arranged that lecturers and members could go from one to the other conveniently, thus ensuring a good attendance and continued interest. Experiences could be exchanged, reports of successes and failures compared, and interesting discussions brought out,

One of the great mistakes of our Pennsylvania fruit growers is the planting of too many varieties. Instead of 15 varieties of apples, I would not plant more than four if planting a commercial orchard. Many fail because of improper care of trees, and from a lack of knowledge of how to pick, store, pack and ship properly. We need to disseminate information along these lines if we hope to secure any standing for our fruit products in the markets of the world. I hope to see the example set by Adams, Berks and Wyoming counties, emulated by every county in the State.

MR. HIESTER.—We have with us Mr. Swartwood from Wyoming county, where they have recently organized a county society. We would like to hear from him.

MR. SWARTWOOD.—Our society is less than a year old and we have had but one meeting which was held in November last. I am not prepared to say much about our organization, but since our meeting renewed interest is manifested in fruit growing, and more sprayers have been ordered since Prof. Surface and his assistants have given demonstrations in spraying.

DR. KOONS.—If in order, I move that the Chair appoint a committee of two or three in each county to endeavor to organize local societies, and have them report at next annual meeting.

PROF. SURFACE.—If that motion is carried I will do what I can to carry out the plan as far as possible. I hope the President will appoint a committee of three in each county to organize a county society.

MR. HIESTER.—We have with us a gentleman from Clinton county from whom we will be pleased to hear.

MR. BAIRD.—I am not prepared to make much of a report. Conditions in our county one not very favorable owing to the presence of San José Scale. There are some small peach orchards in the county that are in fine condition, but not many have been planted during the last five years. There is one district there where there are about 10,000 peach trees, but outside of that there are only a few hundred in about a dozen orchards.

MR. BOYER.—In Snyder county the improved varieties of apples have not yet been very extensively planted. Although we grow York Imperial I have never seen any so fine and so highly colored as those from Adams county. We grow about 25 per cent. York Imperial, 25 per cent. Baldwin, balance Spy, Winesap, Ben Davis and a few Smokehouse. Of peaches we grow more Salway than any other. Beer's Smock is a good bearer, but I have lost more money on this variety than any other.

MR. E. C. TYSON.—Is there any locality in Pennsylvania where pears are grown commercially?

DR. MAYER.—A great many are grown near Atglen, Chester county. They are almost exclusively Kieffer. I was informed that twenty-two carloads were shipped from there last season and nearly as many the previous year.

MR. McKAY.—If a man has a good orchard of Kieffer pear, and transportation is not too high, he will likely realize a good profit by putting them in cold storage. If not allowed to get too ripe they will keep well. The past season was an exceptional one for Kieffer pears. One man stored 2,500 baskets and sold them at \$1.10 per bushel basket. Bartlett's brought from \$6.00 to \$9.00 per barrel.

MR. McSPARRAN.—What says Mr. McKay about York Imperial apples?

MR. McKAY.—I suppose they will bring three to four dollars per barrel in Philadelphia to-day. Stayman's Winesap will bring five dollars. "Nero" is from Delaware and is always ready sale. We also have Lawver and Nickajack, and some brought \$18.00 per barrel, the highest price I ever saw realized for apples. I consider an apple orchard a good investment and any man who will plant 50 acres will find the investment as good as a gold mine. There is generally a rise in the apple market in January. It is claimed by some that York Imperial does not keep well, but I find it keeps well in cold storage. Peaches and watermelons may be kept in cold storage, but soon lose flavor.

MR. WERTZ.—Don't you think there is more money in Ben Davis than any other variety of apple? I saw a commission merchant last fall who wanted 5,000 barrels of Ben Davis.

MR. McKAY.—Several years ago Ben Davis was higher in price than York Imperial, but it is not so now.

MR. BROWN.—Ben Davis keeps better than any apple in the market. Buyers want them for that reason.

MR. WERTZ.—Under these conditions would you graft Stayman's Winesap on York Imperial and Jonathan?

MR. BROWN.—Mr. Wertz's Jonathan are as fine as I ever saw, and if I could grow them as fine as that, I would not grow anything else. One reason why Stayman's Winesap is taking the lead is because it has quality, like Grimes' Golden and Esopus Spitzenburg. The tree also grows vigorously and bears young. The demand for Grimes' Golden is great in New York, Philadelphia and Boston, for Thanksgiving and Christmas dinners. They want a quartette of turkey, cranberries, celery and Grimes' Golden apples.

The following committees were appointed by the Chair:

On Nominations.

W. F. McSparran, Thos. Rakestraw, Jacob L. Rife.

Auditing Committee.

Edwin C. Tyson, A. I. Weidner, Dr. P. R. Koons.

Nomenclature and Exhibits.

A. N. Brown, D. C. Rupp, Dr. I. H. Mayer.

Delegates to Annual Meeting of State Board of Agriculture.

John F. Boyer, Prof. H. A. Surface, Enos B. Engle, Robert M. Elden, Chester J. Tyson.

The following letter from Secretary Critchfield was read by the Secretary:

Pennsylvania Department of Agriculture,

Harrisburg, January 15th, 1906.

Enos B. Engle, Esq., Secretary, Penna. State Horticultural Society,
Gettysburg, Penna.:

My Dear Sir: I have notice that hearings in prosecutions brought in Clinton and Centre counties for violations of feeding stuffs law have

been set for the 16th inst., in Lock Haven and for the 17th inst., in Bellefonte. I shall be obliged to attend these hearings, so that, at almost the last moment, I find I shall not be able to be at Gettysburg meeting.

Please give to your Association assurance of the very high estimate placed by this Department upon its work and my personal appreciation of what the Association is doing for the Agriculture of the State.

Hoping that you may have a very pleasant and profitable session, I have the honor to be,

Very truly yours,

N. B. CRITCHFIELD,
Secretary of Agriculture.

Adjourned.

EVENING SESSION.

After President Hiester called the meeting to order, Prof. Surface called the attention of his field demonstrators to the importance of using note books and pencil freely in noting varieties of fruits and other valuable points likely to come up during the sessions of our meetings.

The credentials of William H. Skillman, Bell Mead, New Jersey, President of New Jersey State Horticultural Society, as a delegate from said society, and of Peter R. Boltz, M. H. Snively and John C. Troxell as delegates from the Lebanon County Agricultural and Horticultural Association, were presented and they were accorded the privilege of the floor.

ANNUAL ADDRESS OF THE PRESIDENT.

BY GABRIEL HIESTER, *Harrisburg, Pa.*

In accordance with a time-honored custom, our Secretary has placed on the program at this time, "President's Address."

I shall not attempt to make a lengthy or finished address, but there are a few things I would like to say.

First, I want to thank you for the honor you have conferred upon me by making me your President. I assure you I do consider it an honor to occupy the chair that has been so ably filled by such men as Howard A. Chase, William H. Moon, Calvin Cooper, S. B. Hieges and Josiah Hoopes. When I leave the chair, if I can carry with me the respect, and esteem, the affectionate regard of the members as these men have done, I shall be fortunate indeed.

We are just now entering upon a period of great expansion in the fruit industry; from every section of this great country, north, south,

east and west come reports of extensive orchard plantations; and not from this country alone, the same is true of nearly all the British colonies.

Fruit growing has passed out of the amateur stage, it is now a commercial proposition of large proportions.

Owing to the extensive home market afforded by our numerous mining and manufacturing towns, and excellent railroad facilities for reaching them, we in Pennsylvania have heretofore cared very little about the general market. Our fruit is practically unknown outside the borders of our State, although, according to the last census, we grow 24,000,000 bushels of apples, 500,000 bushels of peaches, and 434,000 bushels of pears annually, besides plums, grapes and small fruits in great abundance. Our own people consume this immense crop, and in addition many train loads of fruit are shipped in from New Jersey, Delaware, New York and Michigan. But we too are beginning to plant largely. The greatest activity is shown in this South Mountain district. I expect in the near future to see these hills covered with flourishing fruit trees, forming one large apple and peach orchard, extending from the Susquehanna at Harrisburg to the Maryland line, so that notwithstanding our excellent home market in a very short time large quantities of our fruits will be placed on the general market. We will then have to meet the competition of the whole fruit growing world. There are a few points we should bear in mind just at this time:

I. It is of the utmost importance that we plant our trees in the right place; that is, in deep, well drained soil, so that they may have a chance to do their best.

II. We should localize and centralize the different varieties, each where it has been known to develop its maximum quality.

Prof. Craig illustrates this point by referring to the quality of Gravenstein apples grown in the Annapolis Valley of Nova Scotia: "The quality of the fruit, coupled with its vigor and productiveness, has probably done more to advertise the fruit-growing regions of Nova Scotia in the European world than any other factor. So also the Fameuse apple and its allies in the upper valley of the St. Lawrence. The Northern Spy in Western New York, near Lake Ontario," and I think we may also add the York Imperial in the South Mountain region of Pennsylvania.

In the Western and Southern states large corporations have been organized and heavily capitalized for the purpose of growing fruit. I believe, however, that in Pennsylvania fruit will be supplied not by the large corporations so much as by individual growers. Personally I have always been an advocate of the little farm well tilled. The percentage of profit is greater and the quality of the product usually better. But in order to compete in the general market with organized capital, these individual growers should co-operate in marketing their fruit; an organization should be effected in each fruit district. The prospective growers should carefully consider the proper locations for the various orchards. Then they should decide upon the varieties to be planted, and the whole district should confine itself to two or three, certainly not more than four varieties, that succeed perfectly in that place. They should then enter upon a careful systematic study of the markets at home and abroad, with

a view to placing their product where it will be most highly appreciated.

They should make the same careful, systematic study of the dealers in the different markets, and select one man in each to handle their product. That selection should only be made after a careful personal investigation of men and methods on the ground. No money that is spent will yield a better percentage of profit than that which is spent in personally investigating the men who are to handle our crops. The fruit from each district should if possible be brought to a central packing house, and be packed under the direction of one expert packer.

Another important matter for the organization to consider, is the proper disposal of windfalls and culls, by turning them into some kind of manufacturing product, and also the question of cold storage. It is now universally admitted that the most important matter connected with cold storage (next to having perfect fruit) is to get the fruit into the cold room at the earliest possible moment after it has taken from the tree.

My idea as to horticultural organizations—briefly stated—is this: Each district should have its county society, which should be an organization for business, to meet at least once a month, preferably on the grounds of one of the members, taking each in turn, and there discuss all these questions of location and varieties, methods of pruning, cultivation and fertilization, insect pests, diseases, marketing, etc.

Then all of these county organizations should meet once a year as the State Society, and consider questions of interest to all parts of the State, such as legislation needed, the proper enforcement of the laws we have, the advance that has been made in science relating to Horticulture—and just here I would say it is of the utmost importance that we keep in close touch with the Experiment Stations, not only our own, but those of other states, that may be experimenting along horticultural lines. The benefits they have already rendered us by giving us more accurate knowledge of our business in all its details can not be estimated in dollars and cents, and we shall need their aid all the more as the years go on.

In this connection I want to call your attention to a bill that has been introduced in the present Congress by Mr. Adams, of Wisconsin, providing for an increase in the annual appropriation to Experiment Stations.

The total appropriation involved this year for all the Stations in the United States together is \$240,000. The Adams' bill provides for an annual increase in the appropriation until it shall reach the sum of \$720,000. In view of the great benefit we have already received from the work of these Stations, and the large field still open for agricultural investigation and experiment, I think we should give this measure our hearty support, not only as an organization, but as individuals.

Now I want to repeat here what I have said on several other occasions. If you want to see this society flourish, you must not depend entirely on your officers. They will do what they can, but the success of any organization depends upon the earnest, active endeavor of each individual member. We want every one interested in fruit or flowers or ornamental plants in the State to join with us, and we can

have them if each member will make up his mind to bring all such in his neighborhood with him to the next meeting. The question was asked at one of our meetings by a member, "What shall I tell my neighbors to induce them to come with me?" I should say, tell them it will pay them well to come and make the personal acquaintance of the leading fruit growers and nurserymen in the State; to make the personal acquaintance of our Experiment Station workers, hear them talk, ask them questions, join in the general discussion of all questions, and thus get in closer touch with all the men interested in Horticulture in the State.

Each year the demand seems to be growing for a standard fruit package for the whole country. The State of Maine has sent out a circular recommending a national convention for this purpose. It seems to me, owing to the different conditions existing in the different sections of this great country, a uniform package is impossible; but it would be a great advantage to us all if we could adopt a standard barrel and a standard box for the whole country; that is, fix by law the number of cubic inches a fruit barrel should contain, no matter what its shape, and the number of cubic inches a box should contain, no matter what its shape. Then we would have two standard measures, and would know exactly what was meant when we saw them quoted in the market reports.

While we are planting these large orchards for commercial purposes, let us not forget the all important matter of home adornment, ornamental planting around our country homes, and the fruit garden for home use; for what after all has a man in this world but his home, and who can have so pleasant a home, or enjoy more luxuries, than the fruit grower, if he lives up to his privileges?

THE BUSINESS OF THE SMALL FRUIT GROWER.

By H. W. COLLINGWOOD, *Editor, Rural New Yorker.*

My title means the small grower, not necessarily the grower of small fruits. This is a day of big things, business has changed greatly in the past 50 years and will change still more. The old New England farmers used to wait for snow before making their annual trip from Vermont to the Boston market. They went with oxen and sleds, loading their wax, their wool, their maple sugar and whatever they had on it. Just before they started the housewife would boil a kettle full of thick bean soup. When boiled she stood the kettle out by the door over night until it froze solid. Then they poured water on the under side of the iron kettle and knocked out a cheese of frozen bean soup. They bored an auger hole through this and hung a chain through it and hung it behind the sled as they went to market. When they stopped for dinner they took a hatchet, chopped off a few slivers of the bean soup, melted it in a tin kettle over the fire and had their dinner, thus having bean porridge hot and bean porridge cold and in some cases three weeks old. It is a long jump from this to our present system of distribution and sale.

Apples are now sent 3,000 miles from California to find a profitable market. Peaches and plums are brought all the way from South Africa. In thousands of neighborhoods where, when we were boys, meat supplies came from local farms, there is not even a slaughter house. Butchers are only meat cutters. The same distribution of vegetables and fruit is made from large growing centers, and this cuts into the local trade. I remember the time when demand and supply regulated the price of potatoes. If the American supply ran short there was no limit to the price. Twenty years ago I lived in a boarding house in Brooklyn, N. Y. It was a short potato year and the price went to \$5.00 a barrel. I know that our landlady stopped buying at \$4.00 and gave us boiled rice and corn meal instead of potatoes. Now, when the price reaches \$2.75 the fact is at once known all over the world, and potatoes in Germany and Belgium may be taken from the alcohol factory and sent here for eating. They are good potatoes and have found their way into markets a hundred miles back from the sea shore. I speak of this to show how in many cases, what we call, our local markets have been taken away from us. This has discouraged some of our small growers, who think their business is being stamped out by the large concerns. I don't find this so in our country. The big grower can't get down to the retail customers as well as the small grower can. The more hands a package of fruit passes through the more the buyer will distrust it. The big man cannot give personal attention to every package, while the small grower can, and every year we are developing a more discriminating class of customers—they want the best. My experience is that while the present flood of fruit and vegetables will make it harder to sell ordinary goods in the local market, on the other hand it makes it possible to sell first class goods to better advantage. I find that customers like to see the bottom of the package and they like to be able to hold some one directly responsible. I do not fear the finest Georgia peaches or Delaware strawberries when I can pick my fruit after it has ripened on the tree and get it to the customer at once. I find more and more people who realize that the distant fruit has ripened in the car and they can be made to realize the difference. The one exception that I know of to this rule is the sale of California apples. As these come neatly packed and uniform in size and color they take our best trade. We must realize that the Californian growers would be ruined if they were to send fruit as carelessly packed as much that comes from nearby growers. At the same time it is true that many of our Eastern apples are just as good as the California fruit. The latter is packed by experts, who go from farm to farm, packing the boxes for shipment and putting the names on each box. A small grower must pack his fruit properly and stand by his name, that is the best asset he can have. In the old times when local trading was the rule a man went into a grocery store and bought five pounds of coffee. The grocer brought him the package and the man grew suspicious. He opened it before the crowd and found inside a stone weighing 15 ounces. He held it up before the crowd and the grocer put on his spectacles and looked at it carefully. "Why, yes;" he said, "I remember that, I found it in the last tub of butter you sold me and I thought I would send it back to you." In those days that sort of thing would not lose trade, but nowadays one of your customers finding inferior goods in his package cannot get

back at you in that way, without giving you a counterfeit dollar bill or a plugged quarter, which you would not accept.

The best location for a small grower is near some good sized town, for he must have some retail trade. A large town is better than a large city, unless there is a public market where a man can exhibit his own goods. A number of small growers can combine, if they can learn to trust one another and sell their produce at one place. A small grower selling at retail is often at a disadvantage for a year or two, until he makes a reputation and gives up a first class line of goods. I know some strawberry growers at Hilton, N. J., who have gained such a reputation for fine fruit that their berries sell at 18 and 20 cents a quart at wholesale. They seldom ever sell a quart at retail. This is unusual, but it shows the possibility of a good name. The local market is often neglected, people will not see what is close to them, being so eager to look beyond the end of their nose that they don't realize what a beautiful nose they have. I know a man in a country district of New York who makes a good living supplying farmers and people in little country towns with vegetables and fruit. These people learned that he was sure to have what they wanted and so they have quit planting gardens to a great extent. He sold them plants and then when the plants failed to grow he sold them the fruit and vegetables which ought to have been produced. I have been surprised to see what can be sold in my own country neighborhood by merely putting up a sign in front of the farm. We use a blackboard and chalk up the names of what we have to sell. Some people lack faith both in the local market and in themselves and they make no effort to develop either, when in reality the local market is the best there is.

There are two plans for the small grower. One is to attempt to grow a variety, a little of everything, so as to run a wagon and supply all vegetables. The other is to have a good general garden, which gives a fair surplus above the family needs, and put most of his work on two or three specialties. We tried the first for a while, but dropped it, as we never had enough of anything to make a really first class showing. We finally decided to put most of our work on strawberries and transplanted onions, with a surplus of everything in the general garden. This pays us better, though circumstances must decide what the average grower will do. I find that by having good supplies of strawberries of high quality we get a reputation and the strawberries will sell our other goods. Get a reputation for producing one thing well and people will remember you and call for your goods. We sow Prizetaker onions in the hot bed early, transplant the seedlings to rich soil and get enormous onions. People come for miles around to buy these big onions and it is an easy matter when they come to get the order for their winter supply of potatoes, apples, squash or turnips. Another thing that the small grower must look out for is to suit his crops to the soil. We grow the Marshall strawberry, as we think, nearly to perfection. Most people have discarded the Marshall, because it is a shy bearer, but on our heavy soil and hills it gives good satisfaction, yet you can see that I cannot safely recommend Marshall for general cultivation. Something of the same thing is true of other fruits. If we are going to have the best we must find out which varieties will do best on our soil and also which plan of culture will give best results. It is not

always safe to follow the rules we hear given too closely, for a man must work these things out for himself. I bought a farm of 90 acres, though I didn't need over thirty, yet this farm could not be separated. Ten acres is about our limit for gardening, the rest being hill land is planted to peach and apples in sod. I don't hesitate to say that our plan is to avoid work on most of the land, not entirely because we are lazy, but because the hired help question is a hard one, and we have tried to do what we can within the limit of our present family. I observe that many excellent men can do a good day's work alone, but cannot manage the labor of others to good advantage. As a rule hired labor does not pay them and they will do better to handle what they can with their own family. One great advantage I have found in growing two or three specialties is that any surplus from the retail trade will find a good market at wholesale. There will be enough to make a good shipment and it will be good. There are some good partners that will help out a small grower in the sale of culls or inferior. It is usually a mistake to try and sell poor stuff to your regular customers, or to ship it away; better sell it at home. A small canning outfit can be made to pay well. A neighbor of mine puts up fruit and vegetables when the price goes down, selling the canned goods at a fair profit in winter. For a long time commercial canned goods were so plentiful and cheap that it was hard to dispose of the home made article. There is now great distrust in the cheaper canned goods and people are afraid of copper and salicylic acid and this feeling makes a possible market for honest goods. It often happens that good tomatoes, lima beans, sweet corn or small fruits are so low just when the goods are ripe that it is like giving them away to haul them off for sale. They can be put into cans if a fair outfit is provided and held until winter. A man in my neighborhood had a big crop of peppers, which could hardly be given away. The family made a dressing and stuffed thousands of these peppers, selling them in the local city for several times the price of green peppers alone. Many of us have no idea of how markets and methods are changing. I know a man near New York, who was driven out of business, as an old farmer. There was a good spring of water on the farm, which for years had run uselessly away. This man's son dug out the spring, built it up and is selling the water to-day for more than some farmers back from the railroads get for their milk. There are other partners on the fruit farm. I find the hog and the hens useful. We keep hogs in the old orchard, which is in sod and headed high. These hogs tear up the sod and root and eat most of the wind-fall apples. I would rather have the hogs get them than to patronize the cider mill. We must feed the hogs some grain and keep wood ashes or bone before them or they will gnaw the trees. It is astonishing how much pork can be made out of the waste of the garden and fruit. A man who has worked up a retail trade for fruit and vegetables can easily dispose of sausages and small joints to his customers. We find the hog a most useful citizen in working over the manure. This winter we are using a good deal of sawdust for bedding and unless this is thoroughly worked over it will sour the land. We shall use lime wherever it goes. I know some small growers who combine pure bred stock with their crops. As they

cannot keep many head of stock they keep a few good ones. Some popular breed of hens or pure bred hogs can be made to pay if a man can attend to them. I think it pays best in this business to take some odd breed, for instance, Red Polled for cattle, Tunis for sheep, and the Essex or Tamworth for hogs. In this way a small breeder will not have to compete with large ones and the novelty of his stock will attract business to him, but no lazy man need apply for the job. To make a living in this way a man must also have a family of good size with some interest in his work. If the people inside the house are looking only for a nice easy time, without work, such a business cannot be made to succeed. Such a man must be a good salesman, quick to know what people want, a pleasant man to approach his customers and a good judge of prices, he must be thoroughly honest, so that people will trust him and know what his goods are before he shows them. A good supply of personal cards or circulars will help. They should be neatly printed and well gotten up and scattered broadcast over the country where he wants to sell his goods. The plant business may be combined with fruit growing, especially near a large town where people want to start a small strawberry patch or raspberry plantation in the back yard. A man can often do well by furnishing the plants and setting them himself for such people.

I have briefly outlined some of the ways the small fruit grower can compare with the large one. He is not by any means in danger of being crushed out so long as he takes up the work in a business like way and sticks to it properly.

THE PRESIDENT.—We are fortunate in having with us Mr. A. N. Brown, of Wyoming, Delaware, who will discuss "The Three Systems of Orchard Management:"

THE THREE SYSTEMS OF ORCHARD MANAGEMENT.

By A. M. BROWN, *Wyoming, Delaware.*

To the most casual observer it must be apparent that there are many systems of orchard management practiced by orchardists. In fact, much has been said or written upon this subject in recent years a very large majority of fruit growers still follow the paths their fathers trod, or hold some preconceived notion of their own, whether it be founded upon either scientific or practical facts. Again, we have another class who believe a fruit tree will bear no matter what the soil conditions, or what the treatment, providing weather conditions are favorable; and when a tree fails in yielding annually her increase it is due to the weather or that trees only bear on occasional alternate years. A careful study of the constituent elements of tree and fruit, and a knowledge of soil requirements at once proves the fallacy of all such systems or lack of systematic reasoning.

No matter what the methods of the past have been, or what the present are as practiced by many, my subject comprises the entire

range of orchard management. There are practically only three systems, viz.—The Sod System—The Mulch System—and The Cultural System, and a brief discussion of these will, by comparison, perhaps enable us to apply them, with some modifications suited to our several conditions and environments, profitably.

There is no study of nature so attractive, so inspiring or so elevating as the study of Fruits and Flowers; it enlarges man's views of creative wisdom as no other study can. And when we fully realize that a tree is only an instrument with great possibilities in the hands of man to mould, to form, through and by which to create the one product of universal desire and of universal health; in fact, to recognize a fruit tree as being a machine that will produce a product in accord with the kind of food and attention the tree received, we must first know the constituent elements of tree and fruit, and the best system by which these elements can be supplied.

As an illustration, a mature apple tree with a crop of fruit; that is to say, a tree fifteen to twenty years old, producing twenty bushels of apples will take from the soil 1.47 pounds nitrogen, 0.39 pounds phosphoric acid, 1.57 pounds potash; thus an acre of apples set 40 feet apart, which would give thirty-five trees to the acre, would require 51.5 pounds of nitrogen, 14.0 pounds of phosphoric acid and 55.0 pounds potash, necessary to grow the fruit, leaves and wood of a tree of mature age and producing an average crop of fruit. The commercial value of these plant food elements required to produce the crop of fruit as stated is \$11.27. For the purpose of comparison, a crop of wheat, which will yield twenty bushels per acre will remove from the soil 39 pounds of nitrogen, 12 pounds phosphoric acid and 16 pounds potash, the commercial value of which is \$7.25; showing that there is required to produce a crop of fruit \$4.02 worth more of the necessary plant food elements, than that required to produce a crop of wheat. This is significant, in that few farmers at the present day would undertake to grow a crop of wheat without supplying to the soil, upon which that crop was to be grown the plant food elements that the crop required to the extent of the knowledge and ability of the person growing the crop to supply them. There are still two other important facts revealed by the study of this phase of the question, before we can intelligently consider the subject under consideration, viz.—the relatively small amount of phosphoric acid required as compared with that of nitrogen and potash, and the further fact that these plant food elements must be supplied in their proper ratio; an excess of one will not make up for the deficiency of the other; but experiments have shown that the crop can only be measured by the standard of a fully balanced ration. A deficiency in any one of the plant food elements lowers the ration to the extent of such deficiency, that these conclusions are correct and cannot be refuted is proven by the law of nature which controls in the animal kingdom, obtains in the vegetable world with equal force and effect, therefore, to produce a tree, which will bear every year and produce fruit of quality of the very highest attainment possible, we must feed the tree a perfectly full balanced ration of nitrogen, phosphoric acid and potash, keep the trees immune from the attacks of fungus and insect pests, supply the necessary moisture, prune so as to afford the sunlight reaching every leaf that that great mechanical force

of all nature can perform its function, and then thin so as to preserve the vitality of the tree; and he who follows persistently this "dictum" will be rewarded by fine, vigorous, healthy trees, bearing fruit of highest quality, and producing its fruit annually, barring only extreme weather conditions

What are the three systems of orchard management and which will produce the best results for the practical orchardist with the most economy?

The Sod System, which has been mostly practiced in the past, and still has many adherents, has nothing to commend it other than that it saves labor or cultivating, binds washing soils and makes getting through the orchard with teams for gathering fruit, etc., easier, and saves much fallen fruit. But these apparent advantages are overcome by the many disadvantages; in the first place to grow the sod, which usually consists of timothy, red top, orchard or herd grass, requires 70 pounds of nitrogen, 18 pounds phosphoric acid and 77 pounds of potash, the commercial value of which is \$15.25 and \$11.27 worth of these elements are required to grow leaves, wood and fruit of the trees themselves, it will be seen that to grow this seed crop in addition to the trees, it would require the application of manure or fertilizer to the value of \$26.52. But this is not the worst factor in the sod system; if in sod there is an impossibility to control the wood growth and bud formation, and the storage in the tree of the necessary nitrogen, phosphoric acid and potash to develop and bring to full maturity the fruit because the moisture supply cannot be controlled. The cutting of the sod crop and not removing it is not effective with the growing crop thereon; so that the sod system is a faulty one from either a scientific or practical standpoint, and should only be practiced upon such locations as make the other systems impossible. The advocates of the sod system claim that fruit grown under such system will carry better than when grown under any other system. I will grant this, for the reason that such fruit is of low quality; high quality fruit being tender, breaking and juicy, will not stand rough handling, etc., or live as long.

The Mulch System differs from the Sod System in that the soil is cultivated and the mulch drawn on to the orchard, and in this way we secure all the benefits of the cultural system. Moisture, air, nitrification—wood and bud growth at the season that these should be made and storing into the tree all the necessary plant food elements to grow and fully mature the fruit; the difficulties of securing the amount of mulch required, because this system requires just as perfect and complete attention to details and thoroughness as other systems to be successful; this difficulty makes the mulch system on a large scale impracticable.

The Cultural System, practiced upon a thoroughly practical soil, and in accord with present knowledge of soils and tree and fruit physiology is suited to a greater variety of conditions and within the reach of every orchardist. This method, pursued as it should be, requires that orchards should be ploughed as early in the spring as the soil will permit; after ploughing they should be cultivated once a week with such implement as conditions require when cultivating is to be done; this continued each week until July 1st, to 10th, according to lateness or earliness of the season, and culture

should be given twice a week in times of drought; when this culture should cease and the orchard seeded down to cow peas, crimson clover, soy beans or hairy vetch—these should be permitted to remain on the soil until following spring, when they should be ploughed under and this intense system of culture resumed. The advantages of this system are that you grow the wood and buds for the following season's crop in the early summer when they should be grown, and the culture ceases when it should cease to afford opportunity for this wood and buds to harden and fully mature before winter. Again, this cultural system makes it possible for the tree to store up all the necessary plant food elements to fully mature its fruit by the time the culture ceases. Again, the culture conserves the moisture, aerates the soil, and in pulverizing it exposes a larger surface to the action of the oxygen of the air; thus eliminating phosphoric acid and potash in the soil and putting it in condition for the operation of the feeding roots; without humus in the soil and constant culture to conserve the moisture and the fining of the soil it is impossible to maintain the moisture supply needed.

The Illinois experimental station has determined that the amount of moisture in soil cultivated as against soil not cultivated varies from 13 to 27 per cent., or the cultivated soil will contain in an acre 104,000 gallons to 153,000 gallons more water than the uncultivated soil. This added moisture, together with the air admitted into the soil by culture unlocks the phosphoric acid and potash and other mineral elements therein. The growing of legumes by their root system going deep into the soil aerates it, so that the plant food elements can also be eliminated. These crops improve the mechanical condition of the soil by filling it with vegetable matter and humus; this again makes soils alluvial or porous, admitting of the free passage of the soil waters, and retaining this water to be taken up by the tree as required, and lastly it must be remembered that a legume crop managed in this way in an orchard will give to each acre 203 pounds of nitrogen, 49 pounds of phosphoric acid and 202 pounds of potash, valued in the market to-day at \$43.00. This amount of necessary plant food elements is therefore returned to the soil, less the amount required for the growth of the crop itself, and such as may be eliminated in this process of disintegration.

In comparing these systems it can therefore be seen that the intense cultural system not only supplies all natural requirements, and that by growing the legumes at the season when tree growth should cease and fruit maturity should be going forward, all nature's laws are being fulfilled, the necessary plant food supplied without any added artificial manures, and the economy and success of this method clearly recognized.

Dr. Warren, of the Cornell Station, shows that New York orchards tilled five years yielded 80 per cent. more fruit than orchards left in sod five years, where conditions were similar and substantially the same. The question, therefore, of adopting a system that will bring best results should be easy of solution. Location, conditions, environment will necessitate some modification of any system that may be adopted, but the principles as I have indicated must be observed where regular annual crops of fruit of high quality are to be secured. The best evidence of the advance that American Horticulture has

made lies in the fact that we to-day control conditions surrounding fruit culture, instead of having conditions control us. The modern demand of the market for fruit is that it must be of highest quality; and fortunately for the fruit grower he can grow quality into his fruit by feeding his trees a full balanced ration, just as best results are obtained in a dairy herd, by the proper balanced feed; in either case the cow or the tree being the instrument in the hands of man to convert raw material into a manufactured product. In the degree that fruit growers will meet the requirements so clearly indicated by scientific investigation and practical experience, in that degree will Horticulture still further advance as the noblest occupation of man.

DR. MAYER.—Mr. Seeds at our Farmers' Institutes, recommends Cow-Horn Turnips and Essex Rape. Has any one tried them instead of Crimson Clover?

MR. BROWN.—I have used Cow-Horn Turnips and Vetch.

A Member.—I do not attach much value to Cow-Horn Turnips. Twenty tons would not return more than \$1.50 worth to the soil.

MR. PETERS.—I was much interested in Mr. Brown's address on orchard culture. He has, however, based his arguments on Delaware conditions, and not on the diversified conditions we have in Pennsylvania. As to sod culture, Mr. Brown mentions two men who have succeeded. I would advise every one to cultivate according to his particular soil and conditions.

MR. HESTER.—We want to study and consider the principles Mr. Brown has spoken of, want to know what we are working for, then study our own conditions and apply them to our own farms and orchards. When I was young an old fruit grower told me to plow two feet deep before planting my orchard. I followed his advice and the trees grew finely but bore no fruit, and I was obliged to check their growth by sowing to wheat and timothy, at the rate of 10 quarts of the latter per acre, giving two crops of timothy per year for three years. The trees gradually stopped growing but had I checked the growth earlier I would have had less wood growth and more fruit. The treatment which I gave my trees would probably have killed Mr. Brown's in Delaware. I agree with Mr. Peters that we must study our own conditions and apply our own treatment accordingly.

The following resolutions were read by the Secretary and unanimously adopted:

“Resolved.—That the State Horticultural Association of Pennsylvania in annual convention assembled, hereby endorses the bill (H. R. 345) introduced into the House of Representatives by Hon. H. C. Adams, of Wisconsin, to increase the national appropriations to the Agricultural Experiment Stations, and requests the representatives of Pennsylvania in the Senate and House to use their best efforts to secure its passage.

“Resolved.—That the Secretary be instructed to send a copy of these resolutions to Hon. H. C. Adams, of Wisconsin, to Hon. James

Wilson, Secretary of Agriculture, and to each Senator and Representative from Pennsylvania."

The following communication from the "Refrigerator Car Lines Committee," of "The National League of Commission Merchants of the United States" was read by the Secretary:

"Chicago, Nov. 18, 1905.

"E. B. Engle, Secretary, State Horticultural Association of Pennsylvania, Waynesboro, Pa.:

"Dear Sir: Herewith please find the icing features of the rate bill prepared by the Refrigerator Car Lines Committee of the National League of Commission Merchants. These features have already been submitted to many individuals prominent in the producing and shipping of perishable products, and to many organizations of producers of said products and in every instance the said features have been unqualifiedly approved and urged for incorporation in whatever rate bill may ultimately pass Congress and meet the approval of the President.

"We trust the method herein set forth for controlling excessive icing charges which have become such an intolerable and unbearable burden to the producers of the perishable products of the country, may meet your unqualified approval also, and that you individually and your organization will by personal letters and appropriate organization action, at once signify such approval by writing individual letters and sending resolutions or other action of your organization to the chairman of the Refrigerator Car Lines Committee, John C. Scales, directing all communications to Washington, D. C.

"It is the intention of the full committee to meet in Washington in a very short time for conference and to meet with the President and the various members of Congress having rate bills in preparation, and we urgently ask you to at once take action, by sending resolutions, letters or telegrams, as all matter sent the chairman will be for use in Washington, in the struggle for relief of the producers of the perishable products of our country, from the intolerable burden of excessive icing charges they are now compelled to bear, bearing in mind the portentous fact that, if a rate bill is passed void of these icing features, it will be years (if ever) before the beneficiaries of unjust and excessive icing charges will permit an amendment to be carried through Congress covering the regulation of such charges.

"Yours most respectfully,

"JOHN C. SCALES, Chairman;
"Refrigerator Car Lines Committee."

"Icing Clause.

"Section 5. That a rate to provide for the furnishing of ice for the preservation of property requiring ice for its preservation when in transit shall be set forth in the published tariff of the carrier under the heading 'Icing Rate' and the said rate shall state the actual cost

to the carrier of ice per ton placed in the car bunkers at the various initial and reicing points where ice is furnished or required, and the said actual cost shall be the rate.

"Section 6. That it shall be the duty of the carrier to place upon its freight bills the several quantities of ice furnished (if any) at the several icing points with cost as per rate, carrying the same to a column of totals.

"Section 7. That where delay occurs to a car or cars under refrigeration while in transit, and where such delay necessitates the furnishing of additional ice for preservation of contents, it shall in such case be obligatory upon the part of the carrier to furnish said ice, and the cost thereof shall be borne by the carrier.

"Section 8. That where the rate has been made with the view of carrying commodities under refrigeration without additional charge for such refrigeration (as in the case particularly of dairy products) sections 5 and 6 of this act shall not apply.

"Section 9. That if in publishing its icing rate a carrier shall publish a rate for icing other than the actual cost to the carrier per ton, placed in the car bunkers, or shall charge upon its freight bills other than the actual quantity placed in the bunkers, or if a carrier shall by any secret arrangement, understanding or otherwise, either directly or indirectly, enter into collusion with any party or parties whereby a fictitious price can be or is put upon the cost of ice furnished for refrigeration of its own or cars of other carriers, the said carrier shall, for each and every such offense, be fined five thousand dollars (\$5,000.00), and five hundred dollars (\$500.00) for each day of the continuance of such offense."

MR. BROWN.—I think this society should lend its aid to this movement. The icing charges of the private car lines are almost prohibitory and should be regulated by law or by the Inter-State Commerce Commission. I offer the following resolution and move its adoption:

"Resolved.—That this association heartily commends the work of the Refrigerator Car Lines Committee of the National League of Commission Merchants respecting the icing car features of the rate bill prepared by said committee, and approve and urge their incorporation in whatever rate bill may ultimately pass Congress and be approved by the President."

The resolution was adopted as read, whereupon the association adjourned.

MORNING SESSION.

Wednesday, January 17, 1906.

After calling the meeting to order the President announced that a photograph of the society will be taken at the close of the morning session at the court house front. All invited.

The following question from the Query Box was answered by Prof. Surface;

“WHAT IS THE BEST METHOD TO PREVENT MICE FROM GIRDLING TREES?”

PROF. SURFACE.—The subject of preventing mice from eating trees is one of great importance because thousands of trees are lost by mice in this State and I know of one fruit grower in Cumberland county who lost \$2,000 worth of young trees, 5 or 6 years old, last winter.

I could at this time mention 20 suggested remedies but shall refer to only a few of the best.

In the first place, remove the cause of the trouble. That is the grass, weeds and rubbish on the ground. They are attracted by this material in which they find both food and concealment, and which should be removed most carefully in the fall, or better, the orchard should be so cultivated that there will be no accumulation of vegetation on the ground around the trees in winter.

Second. Mice feed almost wholly beneath the snow and generally only when there is snow on the ground, consequently one of the best measures is to pack the snow around the trunk of the trees, as they will not burrow through the ice pack thus formed and will not come on top of the trampled snow to feed.

The chief pest is the short-tailed meadow mouse or Vole. It feeds almost entirely upon vegetation. Its enemies are the owls, hawks, especially the red tail hawk, the screech owl and the black snake, especially during the summer and the latter part of the year.

These enemies to the mice should be preserved as they have no obnoxious habits. It is important to suppress all such pests by encouraging and preserving the natural enemies that are at work on them at all times of the year.

A direct remedy for this pest consists in tying bands of wire cloth, once or twice around the trees extending down beneath the ground and to the height of about two feet.

Another good remedy is to mound the trees to the height of at least a foot in the fall before the ground freezes and the mice will not come out to feed on top of the mound.

A third practical remedy is tramping the snow.

The fourth consists in poisoning them with any kind of poisoned food that they will eat.

A fifth, which is a prevention to both mice and rabbits, is to paint the trunks of the trees with white lead and linseed oil, which is also a preventive against borers.

Mr. Tyson has made some extensive experiments in painting trees with this material and he reports good success. I should be glad if he would give this audience the results of his work along this line.

MR. TYSON.—Two years ago we painted 150 trees as an experiment, using pure white lead and linseed oil. Results were favorable and one year ago we painted the balance of our orchard, 6,000 trees. Of these, 3 were girdled and a few were gnawed a little, but no apparent damage was done, and trees are doing well. The paint

also proved a remedy against borers. We used the paint a little thicker than it is usually applied for second coat work, and painted trees about 18 inches high. An active person could paint about 300 to 400 trees per day. The trees painted were apple. Have never tried it on peach. Raw linseed oil should always be used.

PROF. SURFACE.—This accords with the experience of Prof. Allwood, of Virginia, who tried paint on different varieties of trees with no ill effect.

MR. HIESTER.—I gave Prof. Surface the privilege of painting some of my trees and saw no ill effects.

MR. WEIDNER.—A gentleman near me states that he has tried paint on peach trees, with same result as Mr. Hiester.

SAN JOSE SCALE.

The following remarks and papers by Prof. Surface, Economic Zoologist, and several of his office and field assistants, set forth in a practical way the latest efforts and experiments that are being made by the State for the suppression of this destructive pest:

SAN JOSE SCALE. "HOW IT TRAVELS."

By PROF. H. A. SURFACE, *Economic Zoologist, Harrisburg, Pa.*

The day has passed when it is necessary for expert fruit growers, meeting in a society of this kind, to discuss the subject of the best remedies for the San José Scale, or the possible effects of oils, fumigation, or certain solutions upon either trees or pests. These things are now fairly well established, and we are ready to move to a higher plane and discuss such subjects as some of the details of the life or rate of spread of this pest.

A year ago a paper, presented before this association, contained the statement that during the past several years the scale had not spread more than a few yards. Last fall in the vicinity of the writer of that paper we found he was mistaken, as we could trace its spread from his premises to a distance of two or three miles or more; but general statements of this kind are not as valuable as specific details of what has been found by men making a careful examination over a country of considerable area. As a type of such work, I wish to read from a written report recently sent me by Mr. Charles A. Heiss, our inspector and demonstrator in Centre and Clearfield counties.

Under date of December 5th he wrote as follows. "Yesterday morning I again inspected carefully the premises of Mr. G. and

found that both large and small trees of his premises were generally infested, but in the rear of his lot were two peach trees about six years of age which were very badly covered. From there I went to the peach orchard of C. B., about one mile southeast of here, containing about 1,100 trees, ranging from two to four years of age. I could detect no "Scale" until I came to a tree in the middle of the orchard about three years of age and this was completely covered. Then I inspected around this tree and found the Scale had spread in a radius of four rods from this tree in numbers decreasing as the distance from the tree increased. From all appearances this tree may have been infested from the nursery."

The above sentence shows that since the other trees, which consisted of pear, apple, peach, and plum were only generally infested but not badly covered, the two peach trees mentioned were very evidently the source of the infestation on these premises.

"In another orchard belonging to the same man I found a repetition of the above conditions. Next I went into the peach orchards of W. E. B., one mile south of R. This man has probably 500 trees in three orchards. About his home he has a number of Japanese plum trees. These may range from seven to ten years of age and are infested more or less with Scale but not enough to make it probable that they came thus from the nursery. In the middle of a young apple orchard on the opposite side of the fence I found a number of young apple trees slightly infested. Now close about these trees was absolutely no bad case of infestation and the closest was one tree at least ten rods away, which shows that it must have been carried from there by some bird or insect. Large trees, probably twenty-five years of age were also slightly infested."

Certainly the badly infested tree mentioned above carried the Scale from the nursery, and since this orchard was about three years of age, we are safe in saying that the Scale spread over an area of a circle with a diameter of about 135 feet in three years' time, for a general infestation, and doubtless was carried to some extent to even greater distances. How very important it was that one of our Inspectors should find this spot and show the method of eliminating the Scale here before this fine young orchard was destroyed. This emphasizes the fact that our work, as State Zoologist, to be effective for the fruit growers of this State, must be three-fold: (1) Preventing the spread of the San José Scale from nurseries; (2) detecting its presence where orchardists do not expect it, as in this example; and (3) teaching owners how to overcome it or suppress it, as is done by our practical demonstrations.

"On the opposite side of the block of plum trees spoken of above about two rods distant was a peach orchard of about 200 trees which may have been about seven or eight years of age. This orchard was thoroughly infested throughout and I could not tell where the origin was."

The above portion of his report shows conclusively that the Scale was carried to a great many trees during a few years from some originally infested trees, at least ten rods away. Certainly it was absolutely impossible for the Scale to crawl from these originally infested trees to the others and produce such effects. The conclusion that it was carried by some bird or insect must be correct, un-

less one can conceive that it was blown by a very strong wind, as by whirlwind, which is possible—but improbable.

“South of this and separated by a strip of woodland, probably twenty rods wide, is another peach orchard belonging to this same man, containing about 250 trees. This orchard is situated on a mountain side and is surrounded on three sides by dense forest. No sign of the Scale was found except quite a distance up the mountain side, near the edge of the woods, there was a four-year-old tree which had only one limb on the side toward the forest badly infested. The remainder of the tree was only slightly infested and the trunk was almost clean, showing that the first infestation must have been started on this tree by a bird alighting on the branch nearest the forest. Again the spread of a radius of from two to four rods of slight infestation was found around this tree but no other point in the orchard.”

This point shows decidedly that in those regions where the San José Scale is bad and generally distributed it is impossible to work out such interesting points as this report contains. This locality was especially valuable for the purposes which we had in mind.

“In the orchard of J. M., two miles west of here, containing 450 to 500 peach trees, I could find no Scale.

“This morning I made an inspection of the town and found it to be in a very bad state, probably the worst of any town I have yet been in. Trees fifty years of age, as well as young trees, grape vines, and quince bushes are covered with it. So bad is it indeed that many trees were dead and the bark of many others cracking open, and last summer's growth shriveling up, and it was impossible to tell which was the worst infested tree. However, proving that the Scale does travel across lots in spite of Doctor G's statement that it does not, I went into the field of A. N. C., one-half mile west of P. O., and at least 100 rods from any trees, and there I found about six good-sized apple trees infested with the Scale.”

From the fact that Mr. Heiss found the Scale covering a branch of the tree but not the trunk, he is justified in his conclusion that the Scale was carried to this particular branch, doubtless by a bird, and that it started at this place. It must have been there not more than a year, or the trunk itself would have been covered. Thus in this case we have evidence of the spread of the scale over a circle of at least a diameter of eight rods or over 130 feet within the year, and, of course, the rate of spread would become much larger as the infested area increased in extent. It is possible that a few individual Scales were carried a much greater distance; but, of course, an inspector cannot be expected to find all the pests, especially when they are so small and are likely to find concealment beneath buds and scales. This portion of the report is remarkable as it proves conclusively that the Scale was carried here, at least ten rods or 165 feet, from one orchard to another over a strip of woodland.

“To find how far it had traveled I took a trip of about six miles east of here and could trace the Scale for a distance of three miles from town, although no trees, except one about a mile from town, were badly infested. The remainder of the infestation at a distance of two to three miles from town had apparently just started this summer and so far as I could find was entirely removed from any case of serious infestation and on such trees upon which it could not

have come from the nursery. Beyond three miles I could find nothing, except in a newly started peach orchard six miles east of here, where I found one small peach tree covered and this one without doubt came from the nursery."

The fact that these trees were of large size proves that they were infested by the Scale that was carried to them, because they would yet be comparatively small trees even if they were the very first infested with Scale that were brought into this State, as it has not been with us more than about twelve years and is consequently found only upon small trees, unless it be where it was carried from younger trees to the older ones. As they stood at least ten rods from the badly infested trees it shows conclusively that the Scale was carried this distance, or nearly a third of a mile. This gives full justification for establishing the half mile as a limit within which the Scale must be held in complete check around nurseries to avoid infestation of nursery stock, as is required by the State of New York.

"The name of the agent who sold these trees and who has the large part of the trade in this section is _____. Following this I went west and north and found that the Scale was there also. I went north about three-fourths of a mile and found it on trees fifty years of age with no signs of badly infested young trees."

No better proof is needed in finding the Scale on trees fifty years of age, and no infested young trees nearer than three-fourth of a mile, that the Scale was carried or spread over this entire distance.

This valuable portion of the report shows that the Scale has spread from the original center over a distance of at least three miles, and it also emphasizes the importance of the work of inspection and demonstration which we are doing, and shows the ability of the class of men whom we have engaged as demonstrators, notwithstanding the fact that a self-appointed critic thought it wise to refer to them as "experts of a month's training." While we do not advocate destroying infested trees as in special cases, the destruction of the isolated infested trees is important in such cases as the last mentioned, in order to prevent the spread of the Scale from these small centers of distribution.

"Then I went one mile west of the town and found the Scale in the peach orchard of J. P. G. This orchard is from three to four years of age and after a thorough inspection I could detect not one badly infested tree, but at short intervals I found branches with the Scale thinly scattered over them showing beyond doubt that some foreign body had carried it there.

"These same conditions I found to prevail in two other orchards near here.

"In addition to this I made a trip to _____ and found that these people were not behind the times and had already made the Scale a common study in their town. Here I received an application for a demonstration to be held next spring in the orchard of R. B. This orchard contains about 3,000 trees and is a splendid place for a demonstration. I send the application herewith. The people of _____ are enthusiastic over the work and are spraying and ordering pumps."

There is here such plain evidence that the Scale is carried by such

means as birds flying from tree to tree and branch to branch, that no one can longer doubt it. In the light of these facts the paper presented to this Society a year ago stating that the writer believed that the Scales spread chiefly by crawling from one tree to another is too erroneous to command further attention.

The concluding paragraph of Mr. Heiss is one of the most encouraging possible, because it shows that the citizens in this infested region are awakening to the importance of the work the State is offering them, and will certainly soon overcome the enemy that has caused them such trouble. Demonstrations will be given this spring in that region, and there is evidence that there at least we have friends who fully appreciate our efforts in their behalf. I had intended more fully to discuss the paper that was presented before this Association last spring and which did not meet with the views of members, but even though I asked the writer to be present at this time and defend his points if he could prove them, he is not here, and I consequently prefer not to discuss it without giving him a fair chance.

ORGANIZATION OF THE SAN JOSE SCALE WORK BY THE DIVISION OF ZOOLOGY IN PENNSYLVANIA.

By N. G. MILLER, *Assistant Economic Zoologist.*

When it became certain that an effort was to be made looking toward the suppression of the San José Scale in this State, it became very evident to those in authority that the only method to pursue was to inaugurate a campaign of education as planned and urged by Professor Surface, rather than arbitrarily to lay down certain means of treatment and to force citizens to act accordingly. It was obvious that such treatment could not be put into universal practice, and without this it would, in a case of this kind, be useless.

The question then was, what should be the nature of this educational campaign? What means and methods should be laid before the citizens of the State, and how? These facts were very apparent:

(1) As a general rule the people did not understand the nature of the San José Scale well enough to act for themselves, except in a few localities in a few counties of the southern part of the State.

(2) In but a few localities were the means of combating the Scale well enough understood to be successfully applied by the persons themselves interested. People who understand the nature of the insect did not know the methods to be applied, and were at the mercy of the agents of either unscrupulous or well-meaning but misguided manufacturers. Thus it was obvious that the first effort in the work should be expended along the line of instructing those interested in the best known materials and methods to be used in combating this most injurious insect, and the proper time when this should be done.

The question then arose as to what was the best method. There are two general methods in practical use: 1st, Fumigation with a

gas, like Hydro-cyanic Acid gas (HCN), which is death to all animal life; 2nd, Spraying or washing with some liquid material that will kill or injure by actually coming into contact with the body of the insect.

At first thought fumigation would seem to be the more effective of the two, for assuming that we have a gas and a liquid of equal deadliness to a given organism, the fact that the gas will diffuse evenly throughout any enclosure and penetrate where the liquid will not, should make the gas the more effective. For this reason HCN gas, being the most deadly, is the most effective insecticide known, and is used generally in nursery fumigation where the San José Scale is present, on stock that can be put into a tight fumigating house.

There is, however, quite a difference in the practical work of fumigating nursery stock or even small growing shrubs on the one hand, and orchard trees on the other. The first essential in this work is a gas-tight enclosure. Where trees and shrubs can be easily taken from the ground, and in the course of events, are so removed, this is a simple matter. In this case all that is necessary is that they be placed in such an enclosure and the gas generated therein. When orchard trees are concerned, however, it is necessary to enclose the trees instead of placing the latter in an enclosure. This has been attempted in a number of instances, and although quite successful from an effective standpoint, yet the cost of outfit and labor and unwieldiness of equipment has caused its early abandonment in practically every instance where tried outside the citrus fruit belt of California.

It was with the object of securing data, showing the relative cost, rapidity, effectiveness, and injury (if any) to trees, that a series of experiments in orchard fumigation were started some months ago by the Division of Zoology of the Pa. Department of Agriculture, and will be continued for some time. The general outline of the work was as follows: Several blocks of young trees from three to ten years of age, consisting of apple, pear, peach and plum, were selected. Box frames were erected, having one side removable, covered with tar paper and of such weight that they could be readily carried from tree to tree. These were shoved over the tree by opening the removable side, the computed amount of materials placed therein, the gas started to generate and the openings immediately closed for half an hour. This gas was applied at the rate of 20, 30, 40, 50 and 80 grams of Potassium Cyanide for 100 cubic feet of contents. The normal dosage in nursery stock is 30 grams per 100 cubic feet, but it was found that at the lower strength, 20 grams per 100 cubic feet, every scale was killed. At the normal dosage the cost of materials was about 5 cents each for trees of 8 years, but the cost increases in proportion to the cubic contents of the enclosures, which must have their outer walls larger than the dimensions of the trees to be treated. The first cost of apparatus is represented by the material and construction of four boxes, as described, costing about four dollars each, a total cost of sixteen dollars. Using four such boxes and three men working, about seventy trees could be treated in a day of eight hours. This cost of labor will raise the entire cost of treatment to about 10 cents each for trees of the size stated above. As in the

case of cost of material for making the gas, the outlay for enclosures will increase in proportion to the height and diameter of the trees. At this early date it cannot be definitely stated if the trees were in any way injured. However, we feel certain that they are not, for we have yet to find the first instance of injury to fruit or orchard trees from HCN fumigation where even as much as three times the normal dosage was used. It has repeatedly been applied to dormant trees as strong as eight times the normal dosage with no injurious effects whatever.

There is no doubt whatever but that with HCN gas is the most effective means of treating the San José Scale, and in some instances would be made quite practical, as in the case of a few small or especially valuable trees. Nevertheless, it is not practical for the average orchardist, and could not, or would not be used by any small farmer or orchard owner.

The fact that fumigation is not practical to the average fruit-grower (and the average grower is the one person that should be reached in all cases), makes spraying, by elimination of other methods, the only practical means that can be employed generally at present in combating this insect. If fumigation were as simple and inexpensive as spraying, and yet as much more effective as it is, probably not one person in five would be induced to fumigate for San José Scale. The reason for this is that during the last decade the public has been educated to spray. There are few farmers or small fruit growers who do not know at least something about spraying, and although this knowledge is, as a rule, of little use in spraying for San José Scale in comparison with other insects, yet it makes it easier for these persons to adapt themselves to more difficult and effective work.

The professional orchardist does not, I think, realize the magnitude of the task when we speak of educating the public to spray for the Scale. Such persons have been spraying for years. They would not think of continuing their business without spraying, and do not realize that they are simply about 1 per cent. of all the persons in the State who are trying to raise fruit, and the other 99 per cent. have as yet not attempted to fight the Scale in any practical way. It may be true that this small number of growers raise the larger part of the marketable fruit in the State, yet the fact that they have been successful as specialists does not entitle them to more consideration than belongs to the large number of small and unsuccessful growers. Outside of about a dozen counties practically nothing was known of spraying for San José Scale before the Division of Zoology commenced its demonstration last fall.

Bearing the above facts in mind it was decided that the best method of educating the public was to send out men who were competent to do the work in a satisfactory manner and to teach others how to do so. These men were to be equipped with apparatus sufficiently powerful to show how it should be done, and were actually to make and apply the materials recommended for spraying for San José Scale, and to give such other information regarding the entire work of fighting the Scale and other injurious insects as might be found necessary.

The apparatus carried by the demonstrators must have two requi-

sites: It must be powerful enough to do satisfactory work, yet it must not be too expensive to come within the reach of the average small fruit grower, nor too heavy to be easily conveyed from place to place. The kind of apparatus must be adaptable to the needs of small growers, as the large grower who wishes expensive apparatus has interests enough involved to cause him to go, of his own initiative, to places where he can get the information or instruction he desires. This is just what the small grower cannot do, and such help must be taken to him.

The Lime-sulphur-salt wash was used in this spraying, for the reason that at present this mixture has met with the approval of the best scientists and has been the most successful of all materials with the majority of practical men. Besides it is the simplest to make and the cheapest of the home-made preparations. The objections to it are the trouble in preparing small lots and its caustic action on the exposed parts of the persons applying it. None of the present commercial preparation could be conscientiously used for the simple reason that no such preparation has as yet proven successful enough, nor has any such material been used for a sufficient length of time to justify the recommendation of it at this time. It is to be remembered that this is practical work and not an experimental proposition.

This work during the past fall has been necessarily to some extent preliminary. The State was divided into twenty sections of from one to five counties in each, according to the relative values of interest involved. A man was sent into each district on November 1st with instructions to spend at least two weeks in finding out where San José Scale was most abundant, for at that time there was reason to believe that there were wide areas in the Central and Northern sections of the State where it had not yet appeared. If the Scale could be checked at the boundaries of these uninfested areas, it was reasonable to suppose that such localities could be kept clean for probably many years to come.

Where they found Scale and where demonstrations of spraying were desired and conditions favorable, they were to make arrangements and to schedule such appointments for a later date. All persons making application through the central office were requested to send, with their applications, twigs thought to be infested, since many persons are unable to distinguish San José Scale from several other scale insects, prominent among which are Scurfy and Oyster-shell. Demonstrations were scheduled only at places found to be favorably situated, centrally located, and five miles or more from any other demonstration to be given. As soon as a schedule of meetings was arranged by the agent, some time in advance, they were advertised in the local papers and by circulars or posters placed in conspicuous places.

On the day fixed for one of these demonstrations, the agent prepared one kettle of the material used, which in all cases for San José Scale was the boiled lime-sulphur-salt mixture, and applied this to trees where spraying has been arranged previously. The apparatus used was the ordinary barrel pump with corresponding equipment. The material was boiled in most cases in an ordinary iron farm kettle, holding about 25 gallons. Fifteen or twenty gal-

lons of water was used, and this diluted, after boiling the mixture to fifty gallons or a proportionate amount, with either hot or cold water. The boiling continued for at least one hour, a brick-red color being sought, when the lime used was calcium carbonate, and dark olive green was obtained with longer boiling when using magnesium carbonate. In all cases the Vermorel nozzle and an extension rod were used.

Meetings of this kind were held in thirty counties,—182 in all, with a total attendance of over 5,000. Practically every one of these were interested, practical persons, and assuming that only one out of ten, which is a very low estimate, will spray during the coming season, it means that 500 persons, widely separated in this State, will undertake spraying, who would not have done so but for this instruction. This will not be the end of this work, for it also means that if only one small grower take up the work, in the course of a year or two the majority of his neighbors will be doing it also when they see his profits. This has been the case in certain counties of Southern Pennsylvania, where a few public-spirited and progressive horticulturists began such spraying a few years ago, and where at the present time the properties of these very persons have formed the center around which the most progressive work in the State is being done.

Up to this time at least two important facts have been brought out: From the personal inspection made by these agents it can not now be definitely said that there is a single county in this State where there is no San José Scale. From several it has not been reported, but the inspection in those counties has not been general enough to give definite results. It is present in every fruit-growing section of any considerable importance. Not only this, but it is also generally distributed over local areas, and if it be not general or on all of the trees in such areas, it is on a few at separated intervals, showing that it is just getting a good start, and the worst is yet to come unless active means to fight it are immediately taken.

The work was actively continued until the first of the present year, when it was dropped on account of the unfavorable weather, but it will be resumed this spring at the first opportunity. It will be conducted in about the same manner as last fall, although plans have been made to have it more systematized than formerly. The work of the past season was the first and successful trial of a method originated by Prof. H. A. Surface, Pa. State Zoologist, and never before tried anywhere. It was necessarily somewhat imperfect in the beginning and there were times when the theoretical and practical did not connect owing to unforeseen difficulties of many kinds, but all of these were overcome in due time. An endeavor will be made to prepare early schedules for the demonstrations of the coming spring, from the many applications already received, so that when actual work is started it may continue uninterruptedly. It is hoped that by May 1st every county in this State in which there is San José Scale will have been reached by one or more demonstrations, and before the present appropriation is exhausted it is believed that a representative of the Division of Zoology will be able to give a demonstration in each infested township.

It is certain, from the many favorable reports received and now

on file in the office of the State Zoologist, that the public fully appreciates the value of this very important work, and all interested persons appear anxious to avail themselves of the needed assistance thus offered them by the State.

TESTS OF COMMERCIAL INSECTICIDES.

By T. C. LeFEVRE, *Field Assistant to Prof. Surface.*

In testing an insecticide, commercial or noncommercial, it is necessary to consider it from at least three points of view, viz.:

(1) Does it kill a sufficient number of the insects for which it is applied to warrant its use?

(2) Does it injure the tree or plant to which it is applied?

(3) Is the cost so great as to render it too expensive for practical use?

In considering the efficiency of an insecticide we frequently find mistakes which greatly alter the final results and conclusions.

Among these mistakes it might be well to mention that many users of insecticides fail to consider the scales which are already dead at the time of spraying. On close examination in the early winter or late fall, we found on peach and plum trees, moderately infested, from 10 to 20 per cent. of the scale dead, and on apple and pear from 5 per cent. to 10 per cent. dead. It is our opinion that the number of San José Scale killed by agencies other than insecticides, at the end of an ordinary winter, may reach from 50 to 75 per cent. of all these pests on the tree. This being the case, it can easily be seen what a great difference this would make in our final conclusions, based only upon the percentage found dead when inspecting after spraying. It was our plan to calculate accurately the percentage of scale insects killed by each insecticide. To do this we found the percentage dead previous to spraying on one tree of every lot treated with each insecticide. By taking the differences of percentages before and after the treatment it would seem to give the desired accurate results. Although in theory this method should be a proper means of calculating the percentage of dead scale insects, it will not work out in practice.

After second thought, the obvious impossibility of making any accurate percentage of either dead or living scales within one or two per cent. will be seen. At the best, such a calculation is only an approximation. We must bear in mind that no two untreated trees, nor any two untreated branches of the same tree are likely to have the same percentage of dead or living scales, and the same may be said of any two parts of any one branch. We have frequently examined trees on one branch of which not over 50 per cent. dead scales could be found, on an average, while on another over 50 per cent. were found. In the same way, we have often examined sprayed twigs on which there were spots of several square inches area with not over 1 per cent. of the scales dead, while within 6 inches, 90 per cent. were dead. These facts should enter into the final calculations of percentages of living and dead

scales on treated trees, and the probability of not reaching an accurate figure is so large that it may be regarded as an impossibility. For this reason we do not think it possible that an estimation can be made which is within 5 per cent. on either side of the accurate figure, and any estimation carried out to the fractional part of one per cent. is little else than an absurdity.

A third serious mistake is where trees are not thoroughly sprayed. In this case the insecticide is not given a fair chance, as where parts of trees are missed breeding centers are established for the next season. From these centers the entire tree may soon become entirely re-infested, with the result that the insecticide is marked as "worthless," yet it may have killed every scale that it touched.

Another mistake, although not so common as the others, is where trees are sprayed for an insect with which it is not infested, for it must be understood that no spraying should be done merely for the sake of "spraying," especially with an insecticide which has an oil for its base, as the oil is bound to injure and can do no possible good where the tree is not infested, and consequently will be a waste of material and labor as well as injury to trees.

As to the effect on the tree, it is absolutely necessary to note the condition of the tree previous to treatment. Here again the insecticide is often blamed for something which it does not do, as many times the trees are nearly dead before they are sprayed, and may be so far gone that even the most efficient spraying could not save them, any more than a physician can save a dying man.

In the item of cost is where we find our first great objection to Commercial Insecticides, as when applied in a strength sufficiently strong to be effective we find that the cost is too great for the use of many fruit growers. The second objection to them is their general inefficiency.

Commercial Insecticides on the market at the present time may be roughly grouped in the following classes:

(1) Those having crude oils for a basis, which are rendered soluble by some "secret" means, as "Scalecide," "Target Brand Scale Destroyer," etc.

(2) Modification of the Lime-sulphur-salt solution, as "Con Sol," and "Horicum."

(3) Partial union of 1 and 2, as "Kill-O-Scale," and "Salimene."

(4) By-products of no other use, and for that reason often recommended by the originators as the "only insecticide and fungicide in the world." Some of the last-named compounds have proven to be such as Calcium Sulphate, one of the most insoluble compounds known to chemistry, a paint mixture, which would not kill even the Aphids, and many others too numerous to mention, but all of about the same value as the two just mentioned above.

Early in July Professor Surface outlined and the writer undertook a series of experiments to determine the possibility of spraying during the summer months and hold the scale in check to such an extent as to warrant summer spraying. In these experiments commercial insecticides were mostly used, and the results are summarized below:

In cases where "Con Sol," "Target Brand Scale Emulsion," and "Kil-O-Scale" were applied in summer strength as recommended by the manufacturers, we found that they caused the crawling larvæ

to become fixed and secrete coverings much sooner than when the trees were not treated. When applied strong enough to kill the adult scale the foliage was badly burned, and in some cases the trees were killed.

From these experiments we found to make Summer Spraying successful in the slightest degree we had to spray at least once a week during the entire breeding season. Our best results were obtained by using Whale Oil Soap, 1 pound in 5 gallons of water, which killed a large number of the crawling young, and no harm could be noticed to the tree on which it was applied.

To determine the real value of some of the most widely advertised commercial insecticides, a series of experiments was started early last autumn, and this has been continued up to the present time. Although it is impossible to give the final results of these experiments at present, yet we can now give the results of the trees sprayed prior to December 20, 1905, working on the basis that an insecticide exerts all its influence within a month from the time of application.

Thirty trees, consisting of apple, peach, pear and cherry were sprayed December 6, 1905, with "Horicum," which is a prepared form of the Lime-sulphur-salt mixture, made and sold by the Hammond Slug Shot Works, at fifty cents per gallon when purchased in 50-gal. lots. This was applied in proportion of one part to twenty-five parts of water. One application was made with a result that from fifty-five to sixty-five per cent. of the San José Scale were dead on January 25.

"Target Brand Scale Destroyer," made by the Horticultural Distributing Company, was applied in proportion of one part to twenty-five parts of water on one hundred trees, consisting of apple, plum and a few peach. The result here was very poor, as with the preceding, as not more than fifty or sixty per cent. of the insects were killed. The results were about the same on all varieties of trees. The material was applied December 6, and the last examination was January 5.

"Target Brand Resin Emulsion," made by the same firm as the above, was sprayed on a few trees but owing to a tendency to gum both pump and nozzle it was very difficult to apply. On both the peach and plum trees the results were far from satisfactory. This was applied October 10, and the last examination on January 10, showed not more than fifty per cent. dead. The young larvæ continued to fix and secrete a coating for some weeks after this material was applied thoroughly to the trees infested with them.

"Kill-O-Scale," made by the Thompson Chemical Company, was applied Dec. 8, one part to twenty parts of water, on about fifty plum and pear trees moderately infested. The results here varied considerably, but the average showed not more than fifty to sixty per cent. of the scale dead on Jan. 5. A second application on the same varieties of trees December 19, gave the same results. These results together with the high price of the insecticide (\$1.00 per gallon when purchased in large quantities) would certainly condemn its use in comparison with the more successful and cheaper remedies, such as Lime-sulphur wash or Whale Oil Soap.

Warren's "O. K.," made and sold by S. R. Warren, was applied one part to twenty of water on twenty-five apple and plum trees,

Dec. 8. On these particular plum trees the examination on Jan. 6, showed from ninety to ninety-seven per cent. of the insects dead, while on the apple trees only forty to fifty per cent. were dead. These results may be due to other conditions than the insecticide, but from the count it appears that this material was nearly successful on one kind of tree, and a complete failure on another, although applied on the same day and under the same conditions.

Oct. 5, we sprayed twenty-five apple trees with "Scalecide," made by the J. G. Pratt Co., using one part to twenty-five of water. Examination made two weeks afterward showed that at least ninety per cent. of the scale were dead. On Oct. 10 a block of plum trees were sprayed with the same material and strength, using the same apparatus, and on this lot not over forty per cent. of the scale were dead on Nov. 20. With these varying results it was though necessary to spray more trees for comparison. On Dec. 6 twenty-five apple and plum trees were treated with the same material at the same strength. An examination on Jan. 5, showed from thirty-five to forty-five per cent. of the scale dead, the result upon apple and plum being the same. Further experiments will be made with these materials, particularly with the last two in order to see if the differences are not due to natural conditions of the insects on the different trees rather than to results of spraying. It must be remembered that from fifteen to forty per cent. of the scale insects may be found dead during the winter, even upon trees that have not been sprayed, and consequently the total percentage of dead individuals given above cannot be attributed to insecticides.

From these experiments we are forced to conclude: (1) That no hard and fast rule can be formed as to the success or failure of any commercial insecticide, as we have had a few fairly successful results and complete failures under the same conditions. It is necessary to repeat them several times in order to eliminate the chances of error.

(2) In the majority of cases the failures or partial failures far outnumber the results that would be called even fairly successful.

(3) It is impossible, owing to varying original conditions and final results to calculate accurately the per cent. of scale insects killed, and the margin of variation may be at least five per cent. on either side of the definite result.

(4) That the solution of the problem of controlling the San José Scale by means of commercial insecticides is yet to be solved.

EXPERIMENTS WITH STANDARD HOMEMADE INSECTICIDES FOR THE SAN JOSE SCALE.

By ROSS F. LEE.

Owing to the great increase of the San José Scale and other scale insects throughout the State, the Division of Zoology of Pennsylvania, decided to start a series of experiments with Lime-sulphur-salt mixture and other home-made remedies. There is a great demand

for a remedy which is cheap, efficient, and easy of application, yet not injurious to trees. I am afraid too many of us consider our time wasted which we spend working among our fruit trees. The Scale is simply a reminder and an awakener to the fact that in the past our fruit trees suffered for want of care and attention. A series of experiments were recently undertaken to determine, if possible, the cause of some failures with the Lime-sulphur-salt wash and its variations, in controlling the San José as well as other scale insects. Other remedies, such as Kerosene and its variations, Whale Oil Soap, Warren "Sand Oil" and Caustic Soda were also used.

The failure of an insecticide may be caused in many instances by the mode of application, improper preparation of materials, poor classes of crude material, and inferior apparatus, rather than by the material actually used in spraying. This is especially true in the case of the Lime-sulphur-salt wash. In preparing this material the several processes to be carried out have a tendency, at the best to invite carelessness, although under such a condition this can be more safely used, with success, than can any other insecticide. Care should be taken to select a good grade of fresh stone lime in order to get the best chemical combination possible.

The following are the results of using the Lime-sulphur-salt wash and its variations,—a wide degree of effectiveness being noticeable.

1. Lime-sulphur-salt, self-heated but not boiled with fire, and used in the proportion of 22 lbs. Lime, 17 lbs. Sulphur, and 6lbs. Salt to 50 gals. water, was applied to 50 peach trees. The application was made on Nov. 15th, and an examination in early January showed 45 per cent. of the Scale dead. Another application of the same material on pear and plum on November 2nd showed 65 per cent. of dead scale in January.

2. Lime-sulphur-salt (Formula, 22 lime, 17 sulphur, 10 salt, 50 gallons water), boiled for one-half hour, sprayed on moderately infested trees. Nov. 23rd, showed 73 per cent. dead scale on the last examination, on Jan. 11th.

3. The same materials boiled three-fourths hour and applied to badly encrusted apple, plum and pear, on Nov. 2nd, showed eighty per cent. of dead scale in January.

4. On boiling Lime-sulphur-salt one hour in the former proportions and spraying on peach trees, 96 per cent. of the scale insects were found dead. This variation from No. 2 of 23 per cent. in the number of dead scale should show the importance of boiling for at least one hour.

5. At the side of these trees, Lime, Sulphur and Caustic Soda (not boiled) (22, 17, 6), was used on the same varieties of trees, and at the same time,—only 65 per cent. of the Scale being dead on examination at the same date.

6. Lime and Sulphur (22, 17, 50), applied on badly encrusted peach trees on November 18th, showed 75 per cent. dead scale insects on Jan. 11th.

7. Lime-Sulphur-Concentrated-Lye (22, 17, 2½ lbs.), boiled one hour, showed 85 per cent. dead Jan. 11th.

8. Lime-Sulphur-Caustic-Soda (22, 17, 6 lbs. in 50 gal. water), boiled one hour, gave 80 per cent. dead at the same time.

9. During the latter part of July, apple, peach and plum trees were treated with Lime and Sulphur, (25, 20 lbs. and 60 gallons water).

10. Another lot, of the same varieties and standing beside the former block, were sprayed with Lime-sulphur-salt (25, 20, 12 lbs., 75 gal. water), at the same time. Both lots were boiled 45 minutes, and both were equally badly infested.

A month later only about half the scales were dead, the majority of the dead ones being on the trunks and larger branches, but the tips of the twigs, being protected by the leaves, were yet badly infested. The young and recently fixed scales, however, were practically all dead.

11. Both lots were again sprayed during the latter part of August with Lime-sulphur-salt (25, 20, 12, 75), boiled three-fourths of an hour, and at the last examination, on Jan. 10th, 85 per cent. were dead. Many of the trees, especially apple and peach, were severely injured by this latter spraying, the leaves and young twigs being in many instances entirely killed. Although it is probable that the continued ravages of the scale would also have injured some of the trees severely if continued uninterruptedly until late fall. One fact was brought out in this work, which is true in all summer spraying, and that is the difficulty of doing thorough work while the leaves are on the trees, as it is practically impossible to reach the small twigs with enough material to effectively reduce or kill the scales.

Success with the Lime-sulphur-salt wash depends more upon thorough work than in case of other insecticides. A pump with a high pressure and a good nozzle, producing a fine spray, are necessary to reach the small twigs. It is not as penetrating or searching as the oils, making it necessary in some instances to go over the trees two or three times to reach every spot not covered by the first application. This wash is now well proven to be a fungicide as well as an insecticide, and when applied leaves a white coating on the bark, which aids the operator in finding the missed places. It has been found to be the cheapest and most effective wash known, being absolutely safe in the hands of the amateur. It will not injure the most tender fruit trees when applied during the dormant season, but on the contrary aids in ridding the bark of fungus diseases, which most commercial insecticides will not do.

Lime-sulphur-Caustic-Soda being the self-boiled wash, killed about 10 per cent. less scale insects, in almost every experiment in which it was used, than did the boiled Lime-sulphur-salt wash. There was always more sediment left behind in the self-boiled wash, which tended to clog up the nozzle and render the mixture difficult to spray. It is just as disagreeable to handle as the boiled Lime-sulphur-salt wash, and is not as efficient in keeping down the scale. It is therefore not recommended.

KEROSENE.

Kerosene mixtures used on apple, plum, pear and peach were sprayed on Sept. 21st with some very good results, while others were very poor, as is usually the case when using the oils. These trees were moderately infested with San José Scale on the plum and peach, while most of the pear and apple were also infested with Scurfy Scale.

12. Kerosene and Lime (Limoid), 20 per cent. Kerosene, showed 55 per cent. of the scale dead on Jan. 11th.

13. The same material applied to apple at the same time and strength, showed 70 per cent. of the scale dead.

14. Moderately infested apple, plum, pear and peach sprayed with Kerosene Emulsion (20 per cent. Kerosene), have 95 per cent. of all scales dead at the 1st of the present month. The wide difference in results in using the oils is probably due to the fact that Kerosene tends to separate from preparations with water. These mixtures being applied to the Scurfy Scale on pear and apple did not seem to affect it in the least, the eggs being apparently healthy.

15. Kerosene mixture used on plum, apple and pear, moderately infested with San José Scale, was sprayed on Sept. 22nd, and examined on Jan. 11th, with the result that 90 per cent. of the scale were found dead. (20 per cent. of kerosene.)

16. Warren's "Sand Oil" or Crude Petroleum, used as it came from the barrel, was applied on pear and apple encrusted with San José Scale on Nov. 17th and examined on Jan. 10th. All San José Scales were found dead, but the eggs of the Scurfy were not affected, or at least had the appearance of being uninjured.

17. Experiments with Whale Oil Soap two pounds to one gallon of water on pear and plum, killed 55 per cent. of the scale. This application was made on Nov. 1st, and last examined on Jan. 11th.

18. Caustic Soda, applied November 2nd, at the rate of (a) 7 and (b) 10 pounds to 50 gallons of water showed only 30 per cent. of dead scale. Both strengths burned the foliage of the trees, but at present we cannot tell if there was any further injury. Examination was made, as before, during the first week in January.

In conclusion I would sum up the results as follows:

(1) Caustic Soda is practically worthless as an insecticide for San José Scale.

(2) Whale Oil Soap gave very poor results, even when applied at the strength of two pounds to a gallon of water.

(3) A cheap grade of crude oil killed all the scales, but the trees were materially injured, the extent of which cannot be learned until a later date.

(4) Kerosene and its variations gave very good results in some instances, but very poor results in others. This is probably due to the fact that it is hard to keep the oil from separating from the water with which it is mixed. This same fact accounts for the injury to the trees. Besides these oils being dangerous, they are almost too expensive to be used by the average fruit grower.

(5) The Lime-sulphur-salt washes and variations have proven the most efficient in holding the scale in check. The "self-boiled" washes, where Caustic soda was used, destroyed about 10 per cent. less scale, in every instance, than did the boiled Lime-sulphur washes.

This material has proven the statement made by other experimentors, that **IT IS THE STANDARD APPLICATION**, being the most efficient, cheapest, most beneficial on the trees and **BEST ALL**

AROUND REMEDY at present used in controlling this pest. It is capable of being put in the hands of the careless as well as the careful man, and if the former have no good results, he is at least sure of no injury resulting to his trees. Success with this, as with all other insecticides depends more upon proper work and preparation than upon the merit of the material itself.

THE FOLLOWING IS A CONCISE TABULATION OF THE STATEMENTS MADE ABOVE.

Number.	Material.	Amount.	Time boiled.	Trees.	Number.	Date sprayed.	Date expired.	Per cent. dead.
1	Lime, Sulphur, Salt, Water, 22 lbs. 17 lbs. 6 lbs. 50 gals.,	22 lbs. 17 lbs. 6 lbs. 50 gals.,	Not boiled,	Peach,	50	Nov. 15,.....	Jan. 8,.....	45
2	Lime, Sulphur, Salt, Water, 22 lbs. 17 lbs. 10 lbs. 50 gals.,	22 lbs. 17 lbs. 10 lbs. 50 gals.,	½ hr.,	Peach,	50	Nov. 23,.....	Jan. 11,.....	73
3	Same as above,	Same as above,	¾ hr.,	Apple, Plum, Pear,	80 80 48	Nov. 2,.....	Jan. 14,.....	80
4	Lime, Sulphur, Salt, Water, 22 lbs. 17 lbs. 10 lbs. 50 gals.,	22 lbs. 17 lbs. 10 lbs. 50 gals.,	1 hr.,	Peach,	25	Nov. 10,.....	Jan. 11,.....	96
5	Lime, Sulphur, C. Soda, 22 lbs. 17 lbs. 6 lbs.,	22 lbs. 17 lbs. 6 lbs., .....	..... ..... Not boiled,	Apple, Pear, Plum,	20 40 40	Nov. 2,.....	Jan. 10,.....	65
6	Lime, Sulphur, Water, 22 lbs. 17 lbs. 50 gals.,	22 lbs. 17 lbs. 50 gals.,	1 hr.,	Peach,	25	Nov. 18,.....	Jan. 11,.....	75
7	Lime, Sulphur, Con. Lye, Water, 22 lbs. 17 lbs. 2½ lbs. 50 gals.,	22 lbs. 17 lbs. 2½ lbs. 50 gals.,	1 hr.,	Peach,	25	Nov. 11,.....	Jan. 10,.....	85
8	Lime, Sulphur, C. Soda, Water, 22 lbs. 17 lbs. 6 lbs. 50 gals.,	22 lbs. 17 lbs. 6 lbs. 50 gals., .....	..... ..... ..... 1 hr.,	Peach, Pear, Cherry,	50 6 2	Nov. 12,.....	Jan. 10,.....	80
9	Lime, Sulphur, Water, 25 lbs. 20 lbs. 60 gals.,	25 lbs. 20 lbs. 60 gals., .....	..... ..... 45 min.,	Apple, Peach, Plum,	10 25 25	July 25,.....	Aug. 25,.....	50

TABULATED STATEMENT—Continued.

Number.	Material.	Amount.	Time boiled.	Trees.	Number.	Date sprayed.	Date expired.	Per cent. dead.
10	Lime, Sulphur, Salt, Water,	25 lbs., 20 lbs., 12 lbs., 75 gals., .....	..... ..... 45 min.,	Apple, Peach, Plum,	10 25 25	July 25,..... Aug. 25,.....	..... 50
11	Lime, Sulphur, Salt, Water,	25 lbs., 20 lbs., 12 lbs., 75 gals., .....	..... ..... ¾ hr.	Apple, Peach, Plum,	10 25 25	Aug. 28,..... Jan. 10,.....	..... 85
12	Kerosene, Lime, Water,	1 gal., 5 lbs., 4 gals., .....	..... Mixed,	Plum, Peach, Pear, .....	.....	Sept. 21,..... Jan. 11,.....	..... 55
13	Same as 12,	Same as 12,	Mixed,	Apple, .....	.....	Sept. 21,..... Jan. 11,.....	..... 70
14	Kerosene, Soap, Water, Emulsion, Water,	2 gals, ½ lb., 2 gals., 1 gal., 4 gals., .....	..... Emulsion, 20 per cent. oil,	Apple, Peach, Pear, Plum, Apple, .....	.....	Sept. 22,..... Jan. 11,.....	..... 95
15	Kerosene, Water,	20 per cent, .....	..... Mixed,	Pear, Plum, .....	.....	Sept. 22,..... Jan. 11,.....	..... 90
16	Crude, Petroleum,	Pure,	Pure,	Apple, Pear,	2 10	Nov. 17,..... Jan. 20,.....	..... 100
17	Whale Oil Soap, Water,	2 lbs., 1 gal.,	Mixed,	Pear, Plum, .....	.....	Nov. 1,..... Jan. 11,.....	..... 55
18a.	C. Soda, Water,	7 lbs., 50 gals.,	Dissolved,	Peach, Plum, Pear, .....	.....	Nov. 2,..... Jan. 3,.....	..... 30
18b.	C. Soda, Water,	10 lbs., 50 gals.,	Dissolved,	Peach, Plum, Pear, .....	.....	Nov. 2,..... Jan. 3,.....	..... 30

NOTE.—The experiments outlined above were planned by the State Zoologist, and most of the field work was done by Mr. Lee. The results have been inspected by other members of the force of employees, and a final report will be published after the final inspection next August, when the entire effects on trees, fruit and scale insects can be determined fully.—H. A. S.

FUNGIOUS DISEASES OF ORCHARD TREES AND FRUITS.

By M. B. WAITE, *Pathologist in Charge of Orchard Diseases,*
United States Department of Agriculture.

SPRAYING MIXTURES.

It will not be possible for me to explain the method of preparation of all the spraying mixtures that have been used in the treatment of all the diseases which affect our fruit trees. I will therefore take up two of the leading mixtures used in the orchard and a few of the fungus and other diseases.

There are two preparations that stand out prominently as by far the best of all that are used in treating the orchard. The lime-sulphur-salt mixture is the best for spraying the trees while they are dormant, up to the time the buds have begun to swell in the spring. The Bordeaux mixture, especially if combined with an arsenite, is the best for spraying the trees when they are in foliage and fruit.

THE LIME-SULPHUR-SALT MIXTURE.

The formula varies for this considerably as used by different people in different sections. The mixture is so good that almost any combination of sulphur and lime properly boiled together, usually answers the purpose for which it is intended. We have adopted as our standard formula, however, 15 pounds of flour or flowers of sulphur, 20 pounds of high grade stone lime, 10 pounds of salt, to 50 gallons of water. The sulphur should be mixed with a little water in the form of a paste. About 10 gallons of water should be brought to a boil, or nearly so, the lime added and then the sulphur and salt all practically together. If the lime is not pure high grade stone lime the amount should be increased so as to give the equivalent of pure lime. We have used partially air slaked lime with success, provided we increased the quantity. The mixture can be boiled in an iron kettle or better, by means of steam conducted through a pipe into a barrel or cask. While boiling the rest of the water should be added. This spray should be applied warm and mixed up immediately before using. It is effective against the curl leaf of the peach and against most of the apple cankers and bark diseases of fruit trees. It kills the spores of pear leaf blight, apple scab, the *Monilia* fungus and other things of that sort and retards the first appearance of these diseases but does not prevent summer attacks of them on the new growth. Furthermore it is the best known remedy against the San José Scale and certain other insect pests, so that it combines to a remarkable degree the fungicidal and insecticidal effect. It can not be used after the leaves are out, except possibly as a wash to apply directly to the trunks, as it injures foliage.

BORDEAUX MIXTURE.

The best all around fungicide for use on fruit trees is the Bordeaux mixture. There are various formulæ for making up this mixture and various methods of mixing. I can give only the essential points.

The old standard formulæ for Bordeaux mixture is the 6-4-50 formula, that is using a 50-gallon barrel as the standard, 6 pounds of blue stone (copper sulphate) 4 pounds of lime to 50 gallons of water. Where the lime is of good grade and where the plants are not easily injured, as with Irish potatoes, cantaloupes and grapes, this formula is probably the best that can be used. However, on apples and pears while they are ordinarily uninjured by Bordeaux, there has been a great deal of trouble with russetting. This russetting is probably compensated by an increased quantity of lime and by diluting the preparation.

Furthermore, so much of the lime is bad that it is really safer to use a larger quantity than the standard formula calls for. The 5-5-50 formula is therefore a little safer than the 6-4-50 and has come to be regarded as a standard for apple spraying. For pear-blight, apple leaf blight, and for the smut on the apple fruit and the rust on the pears, the 4-4-50 answers very well. In other words, the formula is slightly diluted.

Where the lime is at all questionable its amount should be increased to make up for the deficiency in strength. On this account many growers are using the 4-6-50 formula.

On peaches and Japanese plums Bordeaux mixture during rainy seasons injures the foliage, producing not only the "shot hole" effect, but frequently defoliating the trees, even before the fruit has matured. It is risky to spray peach trees or Japanese plums, in foliage, with any formula of copper or in fact with any fungicide which we have yet been able to find, but if they must be sprayed and the orchardist is willing to take the risk, a Bordeaux containing a large excess of lime should be used. We regard the 3-9-50 formula as the best formula for peaches.

APPLE SCAB.

This fungus disease is one of the most serious apple troubles in Pennsylvania. A similar disease occurs in the pear, caused by a closely related fungus and is controlled by the same treatment. They may therefore be discussed together.

The scab fungus is especially susceptible to weather conditions. Moist, rainy or muggy weather during the spring months greatly favors the disease, while dry, sunny weather retards its progress. The scab fungus germinates in drops of rain or dew. The spores are able to germinate and enter the tree only during certain favorable spells of weather. We term these periods of moist weather infection periods, and it is a good thing for the fruit grower to recognize such spells of weather as periods of infection when the scab and other fungi are able to germinate and enter the fruits. It is necessary to have the fruits and foliage protected by the spray before these infection periods. As a result, apple and pear scab are both rather difficult diseases to control during a moist season. Spraying must begin very early. The first treatment should be when the fruit trees are in bud, when the cluster buds have opened out, but before the blossoms have opened. Usually by beginning on the earlier blooming varieties and having everything ready to strike promptly, the orchard can be sprayed when in bud before the blossoms open.

The second treatment should be made just as the last blossoms are falling. Here again there may be a difference of two or three

days in the time the different varieties can be treated. In the second application it is advisable to add the arsenate of lead or Paris Green to the Bordeaux mixture and destroy the codling moth as well as the apple scab fungus.

The third treatment should be made seven to ten days later. If the season is dry, from this on additional treatments may not be necessary. However, if the season is moist, two or three additional sprayings at intervals of two weeks may prevent later infections and be of value in saving the crop. The later treatments for apple scab are made when the tree is in full foliage and will be effective in preventing the leaf blight of apples. There are two or three leaf blights caused by different fungi, but they are easily preventable by spraying after the trees are in full leaf.

BITTER ROT OF APPLE.

Until the past season this fungus disease has been one of the troublesome problems in orchard pathology. No one had been able to control the disease with even reasonable satisfaction. The disease is particularly abundant through Maryland, Virginia and west to Missouri, through the southern portion of the commercial apple districts of this country. So far as known it rarely destroys fruit in quantity in this State but as it does occur and may some time be injurious, you will be interested in the recent successful results.

It has been extremely destructive in the Yellow Newtown apple districts of Albermarle and adjacent counties of Virginia. In recent years it has been destroying almost the entire crop of many sections. During the past season Mr. W. M. Scott, Orchard Pathologist in the Bureau of Plant Industry, carried on a successful series of spraying experiments which showed exactly how to treat the disease and which saved in some cases as high as 98 per cent. of the crop, although on the control trees left unsprayed less than half a dozen sound apples could be found, the entire crop was ruined with this fungus rot. As the result of this extensive series of experiments, Mr. Scott outlines the treatment for Bitter Rot as follows:

Spray with 5-5-50 Bordeaux mixture, beginning June 10th to 15th, five to seven times at intervals of two weeks.

The results of his experiments showed that much of the spraying previously had been attempted too early in the season, that in order to secure good results it is necessary to begin about the middle of June and keep the fruit thoroughly coated with the Bordeaux mixture throughout the summer. After the fruit becomes thoroughly coated by three or four sprayings, the mixture stays on pretty well until picking time.

APPLE CANKER.

We have had a good deal of complaint from Pennsylvania as well as other sections of the country about fungus diseases on the bark of apple trees. There are some half dozen different species of fungi which produce apple canker. Sometimes these apple canker spots resemble pear blight, and conversely the pear blight disease itself produces dead patches on the limbs and trunks of apple trees resembling canker work. Apple canker, as suggested above, is largely checked by dormant spraying with lime-sulphur-salt. It is also controlled, at least partially, by the Bordeaux mixture spraying. How-

ever, where there are old cankers, it is desirable to prune out as much as possible of this trouble where it is on smaller limbs and to gouge out the dead spots, soak them thoroughly with some fungicide like corrosive sublimate or sulphate of iron and dilute sulphuric acid and then paint the wound with white lead paint.

PEAR LEAF BLIGHT AND FRUIT SPOT.

This is one of the commonest diseases of pears and it occurs on quinces as well. It not only spots up the fruit, making it unsightly and partially or wholly unmarketable, but it defoliates the trees, cutting down their vegetative vigor and productiveness. Trees affected for three or four years with pear leaf blight soon get in a stagnant condition. They bloom profusely, in fact they are snowy white with blossoms, but they set little fruit. The remedy for trees in this stagnant conditions is to prune them back pretty severely, removing two-thirds of the bearing wood and fruit spurs and then spray them after the foliage has formed, with Bordeaux mixture.

This disease is so easy to prevent that in my own orchard I use 4-4-50 formula of Bordeaux for this purpose. About two or three treatments are ample for this disease. The first treatment should be made between May 15 and June 1, when the trees have come into full leaf and when the young pears are three-fourths of an inch in diameter. Of late years the Kieffer and the Le Conte pears have been attacked seriously by this disease, although ten years ago it occurred very slightly on these varieties.

PEACH AND PLUM ROT.

It may be well to call your attention to some of the diseases which are not so easily controllable. The brown rot of peaches and plums is a very disastrous disease. It occurs from the Great Lakes region, the northern limit of peach culture, to the Gulf, and with increasing severity as one goes southward or toward the ocean. It is less serious in the mountains than it lower altitudes. So far we have been unable to control this disease satisfactorily by spraying. Bordeaux mixture will reduce its ravages to some extent, frequently there being 50 per cent. less rot on sprayed trees, but this is not regarded as satisfactory.

The dormant spraying with either Lime-sulphur-salt or with Bordeaux also produces some good effects, but I have seen the rot occur very badly on trees thoroughly sprayed for two consecutive seasons with Lime-sulphur-salt wash, so that it does not prevent the trouble.

We have carried on elaborate experiments with this disease and are working hard upon it, but so far we have not mastered it.

APPLE ROOT ROT.

Here is another fungus disease that has baffled all attempts at a remedy. In fact it is a very unpromising, almost hopeless type of trouble. We have no treatment that we can apply to the roots in the way of fungicides or germicides and so far the apple root rot has remained strictly unconquered. When all the other troubles are straightened out perhaps we may be able to get some hold on this difficult problem.

PEAR BLIGHT.

This disease, which is caused by a bacterial germ, occurs on the pear, apple, quince, and other plants of the Pome family. It has been one of the stumbling blocks in orchard diseases for years, but during the last few years through the careful working out of the life history of the bacillus which produces it, we are now able to control this trouble. It is only a question of careful thorough work. This disease is transmitted by insects on the blossoms, not only the common honey bee, but flies, wasps and other insects carry it from flower to flower and from orchard to orchard. It is also occasionally carried long distances by birds. This disease is infected mainly through the blossoms, but it is also infected to a large extent through the tender tips of growing twigs and occasionally through the fleshy bark of twigs and branches. Most of the germs die out in the tree shortly after they are produced, but occasionally the disease is able to continue in the tree until autumn. Along the advancing margin of the trees the germs keep alive and if they can keep on multiplying until the tree goes into a dormant condition in the winter, they are able to live through the winter and begin to grow again the next spring. When root pressure gorges the tree with sap in the spring this causes the blight to start off with renewed vigor. A gummy substance exudes unto the bark under certain weather conditions and this gummy exudate is the virus of the disease, is carrier onto the opening blossoms and thus the disease spreads. These hold over cases become the new infection centres each spring. The blight has no other means of living over winter. Such cases therefore constitute the key to the whole pear blight situation. Cutting them out and destroying them puts an end to the disease so far as any orchard is concerned. The cutting out has to be skillfully and thoroughly done. A disinfectant has to be carried when doing this cutting and the knives and saws kept thoroughly wiped sterile to avoid spreading the disease. It is also necessary to wipe off the wounds after each cut. For this purpose corrosive sublimate solution with the strength of 1 to 1,000 in water is the best material.

PEACH YELLOWS.

This disease has attracted a great deal of attention in past years. In fact, it has been considered one of the most obscure and difficult diseases in the whole category. It still remains in this class as far as its cause is concerned.

Pathologists have been wholly unable to find out the cause of the disease. On the other hand when it comes to the remedy this disease is the easiest to control and is the most economically combatted of any of our serious orchard troubles. The method of control consists of a thorough inspection of each tree in the orchard during its fruiting period and the prompt removal of the tree by digging it up. The safest plan is to burn the tree on the spot. As a rule the diseased trees can best be found by inspecting them at the time of the ripening of the fruit, but as a general method of procedure it is well to inspect them tree by tree and row by row, three or four times during the season, once in July, once in August and once in September.

The best symptoms of this disease are the premature red spotted fruits which occur on the diseased trees, even before they show the yellow discoloration of the foliage. Later a wiry twig growth occurs and a yellowing of the foliage. The yellowing foliage is typical but hard to describe and is often confused with similar discolorations produced by borers, winter killing, starvation, root aphid and other causes. It will be noted that the last two diseases are controllable by the eradication method.

It might be well to call your attention to the fact that this is an entirely different style of treatment from the spraying which has yielded such excellent results in other lines of orchard diseases. But we have parallel cases in diseases of animals and even in human diseases. While there is no remedy for small-pox, typhoid fever nor yellow fever, yet these diseases are controlled by quarantine and isolation and destruction of the infection centres and the mosquito and flies which carry the disease about, paralleling our destruction of the infection centres in pear blight and peach yellows. In diseases of animals the foot-and-mouth disease of New England and the pleura-pneumonia have been controlled by killing and burying or destroying the infected herds. Greater triumphs have been secured in a way by these quarantine methods than by doping people with medicines. So in our orchard pathology; in case of certain diseases like pear blight, peach yellows and the rest of the yellows group, we can achieve greater triumphs by stamping out and controlling diseases than by the more expensive annual treatment by spraying.

Adjourned.

AFTERNOON SESSION.

Edwin W. Thomas, Treasurer, submitted his annual report which was accepted and reported to the Auditing Committee.

The statement showed a balance of \$85.15 in the treasury.

Mr. Rakestraw, of Committee on Nominations, submitted the following list of officers for the year 1906.

President, Gabriel Hiester, Harrisburg.

Vice Presidents: Hon. W. T. Creasy, Catawissa; Thos. B. Meehan, Germantown; Dr. I. H. Mayer, Willow Street.

Recording Secretary, Enos B. Engle, Waynesboro.

Corresponding Secretary, Wm. P. Brinton, Christiana.

Treasurer, Edwin W. Thomas, King of Prussia.

The aforementioned nominees were duly elected by ballot.

Harrisburg was chosen for next meeting, and date of meeting was changed from Tuesday and Wednesday, January 15 and 16, 1907, to Wednesday and Thursday, January 16 and 17, in order to avoid the crowd and excitement incident to inauguration day, which will be January 15.

The following paper was read by Prof. Wm. A. Taylor, Pomologist in charge of Field Investigations, U. S. Department of Agriculture:

THE POMOLOGICAL INVESTIGATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

By PROF. WM. A. TAYLOR, *Pomologist, U. S. Department of Agriculture, Washington, D. C.*

The pomological work of the Bureau of Plant Industry may be roughly divided into two general lines, namely, systematic and economic work, though in fact all the work thus far undertaken in this field has a definite economic relation and practical bearing. The term pomology, which has been variously applied by writers, may perhaps be most accurately defined as the science of fruits and the art of their culture. The science of fruits is largely concerned with the study of their relationships to each other and the determination of their relative adaptability to various combinations of soil and climatic conditions. Only through knowledge of these points can any intelligent forecast of the probable behavior of a variety in a particular region be based, and the risk of failure of varieties in regions new to them be reduced. One of the most important requisites in systematic pomology is an accurate, clear and stable nomenclature. This is necessary in order that the observations of widely scattered observers may be utilized in determining the cultural range of varieties, and the uses to which they are best adapted. In America this question of nomenclature has been and still is of very great importance. Our commercial fruit industry has been developed with such startling rapidity in districts so widely scattered, and from native and introduced species of such diverse characteristics that the workers in systematic pomology have been overwhelmed in the wealth of material available for, and needing their attention. In every new section successively occupied by the pioneers as they have moved westward, old varieties have reappeared under new or entirely erroneous names, which, mingled with those of the new sorts that have originated in the particular sections, have resulted in radical regional differences in the names of varieties in the nurseries and orchards.

A few familiar cases may be cited. The Baldwin apple of New England became Steele's Red Winter in Western New York, which name through a mistaken identification later become firmly attached to Red Canada in Michigan, where it still persists in the older orchards. The Yellow Newtown of Long Island, transferred to the warm and fertile mountain coves of Virginia became the Albemarle Pippin of the mountain region below the Potomac River. The Mumper Vandevere of Pennsylvania, grafted in Northern Illinois for Yellow Newtown, became the Minkler of that State and the great Mississippi Valley, and has been so widely distributed under that name and so firmly fixed in pomological literature that it takes precedence over the earlier name of the variety; the Napoleon cherry of the European lists is almost universally grown in California and Oregon as Royal Ann; the Pond plum as Hungarian Prune.

Systematic investigation of the apples grown in family orchards reveals the fact that a large proportion of the varieties in them, outside of a few standard commercial sorts, are either unknown by name to the growers or are incorrectly named.

This condition made it necessary that special attention be paid to the nomenclature and identification of fruits in the early years of the Department pomological work. In co-operation with the American Pomological Society, the State horticultural organizations, and the horticulturists of the experiment stations, a fair degree of uniformity in the various names in formal catalogues and volumes has been attained. A large number of public spirited fruit growers and nurserymen throughout the country have generously aided in this work, which is still in progress.

In connection with this work, an invaluable collection of accurate varietal descriptions, photographs, water color paintings and facsimile models and herbarium specimens has been accumulated which constitutes an important feature of the working equipment of the office. The continuous policy of those in charge has been to assemble in this collection all varieties of fruits grown in North America, so that workers interested in pomological questions may have access to them for the prosecuting of their investigations.

Necessarily the identification of varieties from specimens sent by growers and others has become an important feature of the work, the receipts for this and allied purposes having averaged nearly 3,000 lots of fruit per annum during the past five years. Such work is recognized as having a distinct and immediate value to fruit growers as well as a definite bearing on systematic pomological work, so that growers are, upon application, furnished with mailing packages and franks with which to forward specimens for this purpose.

Publications on particular fruits embodying the results of these investigations are in preparation. One, "The Nomenclature of the Apple" (Bulletin 56 of the Bureau of Plant Industry), was issued in 1905. This comprises the known varieties of this fruit referred to in American publications between 1804 and 1904, the first century of American pomology, and includes some 15,000 apple names and synonyms, with tabular descriptions and references to places of origin and first publication so far as determined.

Actual and supposed new varieties, whether yet introduced or not, are received in large numbers from originators and nurserymen for opinion as to their exact identity and their relative value in contrast with sorts already known, also for suggestions of suitable names not previously used.

Such work as this, in addition to a large volume of correspondence upon matters relating to various phases of the fruit industry both systematic and economic, makes up the distinctive office of indoor work in pomological investigations.

FIELD INVESTIGATIONS.

Since 1901, the distinctive field problems in pomology, most of which are of direct economic importance, have been separately grouped for convenience in administration. These comprise those lines which embrace experimental studies of problems connected with fruit marketing, transportation and storage, viticultural investigations, fruit district investigations, and a number of miscellaneous field problems.

Under the general head of fruit marketing, a systematic experimental study of the various questions involved in that subject is

being made with special reference to its bearing on the development of export trade in American fruits. It is becoming very generally recognized that with such fruits as the apple, the pear, the peach, the orange, and possibly some others, the yield in favorable seasons in future is likely to be much larger than has been the case in the past. A wider distribution of the product must, therefore, be accomplished if disastrous gluts are to be avoided. While the larger part of our fruit product will no doubt always be consumed in America, the export is recognized as one of the most important safety valves for surplus fresh fruits.

Series of shipments to British ports have demonstrated the entire practicability of delivering there in sound and wholesome condition, early summer apples, peaches and pears of the varieties best adopted to our domestic markets and at times when our surplus of them are very likely to occur. In a number of instances such shipments have yielded higher net returns than the home markets even in years of high prices at home. In the case of the Bartlett pear in New York a large and in the main profitable, export trade has already developed along the lines experimentally determined and demonstrated by the Department.

The profitable exportation of peaches is considered a more uncertain matter largely because of the fact that the peach is not yet sufficiently well known to the great mass of population in northern and western Europe to be in steady and large demand. The fact that in favorable seasons Elbertas from points as diverse in their conditions as Georgia, Oklahoma and Connecticut have been delivered in London in good order, and have netted their growers values nearly or quite equal to home markets, is sufficient to indicate that the field is a promising one. Early apples, from those districts like the Chesapeake Peninsula, which can place their product under refrigeration in the foreign markets within ten days after leaving the tree, are worthy of further attention in particular localities, especially in seasons when the European crop of summer fruits and the Australasian crop of winter apples which come into competition with them are light.

But far more important than any of these is the export trade in winter apples. In all but our very lightest crops the export demand has in recent years been the most important factor in determining the prices of sound fruit during the autumn and winter. For this reason, particular attention has been paid to such questions as size and style of package, method of packing, suitability of variety to market, etc., as well as to the introduction of American apples to markets where they have not hitherto been used in commercial quantities. Series of shipments of winter apples from representative apple sections, packed in barrels and boxes, both with and without wrapping, comprising both graded and ungraded fruit, are now being made to the principal European seaports to obtain actual experimental data on these vexed questions, which it is practically impossible for the grower to determine for himself except through long and frequently costly experience. Progress reports of this work are given out from time to time through papers before associations, such as this, and will eventually be summarized in bulletin form for distribution.

FRUIT TRANSPORTATION AND STORAGE.

Under this head a comprehensive investigation of the entire question of the handling of fruits for transportation and storage has been in progress for the past four years. Experiments conducted with the more important commercial varieties of apples, pears and peaches, in some of the leading districts for those fruits have demonstrated the necessity of picking at proper stage of ripeness, carefulness in handling, promptness of forwarding and withdrawal for consumption before the product has past its stage of full maturity. Perhaps no fact developed in this investigation is of greater fundamental importance than this, namely, that the durability and value of fruit destined for cold storage are as vitally affected and as surely damaged by careless handling in any stage of handling or shipping as in the case of fruit destined for immediate consumption. The loss in the former case is, in fact, frequently greater than in the latter, because of the additional expenditure for freight, storage charges, etc., and the inevitable risk of deterioration before an opportune time for sale occurs.

To quote from the report on this work for the last season:

"The experiments during the four years have shown conclusively that a large proportion of the difficulties in apple storage may be overcome by more rational handling of the fruit before it is stored, and by giving it better care in some respects after it reaches the storage house. Apple scald, one of the most serious storage troubles, is not yet well understood, but the experiments have again demonstrated that it can be controlled commercially by picking the apples when hard-ripe instead of prematurely as many winter apples are picked; by storing them quickly after picking, in a temperature of about 31 degrees F., and by selling the more susceptible varieties comparatively early in the season. The premature ripening of apples in storage is often the result of delaying the storage too long after the fruit is picked. These investigations continue to emphasize the supreme importance of quick storage after the fruit leaves the tree. The "slumping" of apples in the barrels due to the development of the common blue-mold fungi in the spring, is generally the direct result of rough handling of the fruit while it is being picked and packed. The skin of the fruit is bruised, and the rots enter and grow vigorously if the fruit is not stored quickly in a cold temperature after picking. The investigations continue to emphasize the need of uniform temperature as low as 31 to 32 degrees F., for long term storage, and of pure wholesome air in the warehouse if the flavor of the fruit is to be retained without contamination. Cold stored fruits are frequently injured in quality through the lack of proper ventilation of the storage warehouse. This side of the storage question needs further investigation, which cannot be satisfactorily made until the Department has an experimental storage plant."

The effect of the environment under which fruit is produced, upon its keeping quality in storage is being studied experimentally with fruit from trees of different ages, in different soils and from different climates. In co-operation with the N. Y. State Exp. Station, a comprehensive investigation of the influence of various methods of culture, such as clean cultivation vs. sod culture, etc., is under way.

The comparative value of a large number of varieties of apples from different apple districts has been studied for the past four years with a view to determining their relative fitness for storage.

During the past year a special study of farm storage houses has been inaugurated and will be continued for a sufficient time to obtain light on the relative efficiency and economy of farm storage houses cooled with ice, ice and salt, brine cooled with ice and salt, and mechanical refrigeration in eastern New York. It is believed that in certain parts of the North a distinct advance in fruit storage can be made through the utilization of properly constructed storage houses where the fruit can be held by the owner in first class condition for use as needed by his markets, at less risk and expense than are involved in storage in a plant outside of his personal observation and control.

The practicability of freezing small fruits for use by bakers and confectioners in flavoring ice creams, sherbets, etc., and for use in pies is also being investigated. Such quickly perishable fruits as strawberries and raspberries, which can only be held in good condition in ordinary storage for a very few days are found to be preserved in practically perfect flavor and condition for several months by freezing quickly before they are overripe. This new phase of the cold storage business is already becoming of large commercial importance in some of the larger cities.

FRUIT TRANSPORTATION.

For some time past the conditions directly concerned in fruit transportation have been under investigation, and these have now assumed such importance that they are being given special attention. The behavior of peaches in refrigerator cars as shipped from Georgia and California is being thoroughly investigated, both at shipping point, in transit and at destination. In this connection, thorough tests of the precooling of fruit intended for such shipment are being made. In the case of peaches in Georgia it has been found that a large part of the rot in transit to northern cities occurs in the two upper tiers of carriers in the car, the three lower tiers arriving at destination in sound condition. This unequal condition is unquestionably due to the very rapid cooling of the fruit in the bottom of the car and emphasizes a conclusion previously reached in these investigations that quick cooling after picking is a fundamental requirement in successful cold storage or shipping operations. In both Georgia and California the preliminary work along this line has been done in refrigerator cars on track which were equipped as stationery refrigerators in which the fruit could be quickly reduced from the temperature of the outside air to about 40 degrees F. by the use of ice and salt. Fruit cooled in this way, before being loaded into the cars for shipment, was found to arrive at destination in much better condition and to remain sound longer after arrival at destination than that shipped under ordinary icing, even where well ripened fruit was used in the precooling tests and prematurely picked hard fruit for the ordinary shipments.

This line of work, of course, involves a radical change in some of the present commercial methods of shipping, and further tests are needed before investments in precooling plants could safely be made.

In this connection, an investigation of the causes of decay in oranges and lemons in transit from California to Eastern markets is now under way. The losses from this cause are said to have aggregated not less than half a million dollars a year for several years and to seriously menace the future of the industry. As the result of systematic observation of the practice of growers and packers in the handling of oranges it was discovered early in 1905 that about one-fifth of the orange crop is made susceptible to decay by improper handling before the fruit is packed. These injuries are caused by the puncture of the skin with clippers used in cutting the oranges from the trees, by punctures from stems left too long, by finger nail cuts in handling and by other mechanical injuries in the handling of the fruit in orchards and packing houses. Experiments having demonstrated that from 10 to 50 per cent. of these injured fruits are likely to decay if favorable conditions of heat and humidity develop, growers were notified of the danger, and as the industry is quite thoroughly organized the information was immediately put into practice, with the result that one of the leading growers and shippers of southern California estimated in the spring of 1905 that the Department investigations in that section had saved the industry at least \$200,000 on the last crop. Extensive tests in precooling oranges, but in stationery storage houses and in cars on track by blowing cold air through them after they are filled with fruit until the temperature of their contents is reduced to a satisfactory point, have demonstrated that with oranges, as with peaches, quick cooling is an important factor in checking the ripening processes and in preventing the development of rots.

VITICULTURAL INVESTIGATIONS.

Under this head a comprehensive study of the relative adaptability of phylloxera resistant stocks to soils is being made in California, where nearly, if not quite \$100,000,000 is invested in the viticultural industry. Other allied questions are also under study there in nine co-operative experimental vineyards located in representative viticultural sections of that state. During the past year a special study of the rotundifolia or Scuppernong type of grapes in the South Atlantic and Gulf states has been begun. It is believed that this native species is capable of quick development into an important cultivated type and that its varieties will be found well adapted to the climate and soil conditions of the South Atlantic and Gulf states where other cultivated grapes are grown with much difficulty and at considerable risk of loss by the grower.

FRUIT DISTRICT INVESTIGATIONS.

Under this head a careful field study of the adaptability of varieties of orchard fruits to particular soils, elevations, slopes, etc., is being made with a view to determining through actual observation as well as through the recorded experience of fruit growers the exact conditions under which varieties reach their highest perfection and meet the most evident needs of our markets. This work has thus far been mainly limited to the Allegheny mountain region, from Pennsylvania southward, and the Ozark region of Missouri and Arkansas. In connection with it, exact data on the blossoming

and ripening dates of particular varieties in most of the important fruit districts of the country are being made by several hundred volunteer observers, with a view to securing accurate information on points connected with the selection of varieties for mixed planting when cross fertilization is necessary and for ascertaining the duration and exact time of the blossoming periods for use in those portions of the country where the relation of these phenomena to the average date of last killing frost is important. A report upon this subject covering the South Atlantic states is already in manuscript and will soon be published.

MISCELLANEOUS PROBLEMS.

Under this head investigations of the cultural varieties of the pecan and other nuts are in progress and of the peach and other fruits. A special study of the summer apple industry of the Chesapeake Peninsula has been nearly completed, and an investigation of the apple evaporating industry as it exists in the East, both of which are about ready for publication and distribution.

MR. McKAY.—I would like to ask Prof. Taylor as to the standing of "Winesap" in the foreign market.

PROF. TAYLOR.—We have reports that "Winesap" is not a desirable apple in the Glasgow market. In London and Hamburg it seems very popular. During the last two years the foreign markets have been taking "Golden Russets" at higher prices than they paid for red fruit. "Grimes' Golden" and "Jonathan" are generally exported at a loss. "York Imperial" is an excellent export apple especially in German markets, but it is sometimes liable to scald. This tendency is more marked however on fruit from young trees.

The following paper was read by S. Morris Jones, Westgrove, Pa.:

WHY NOT MORE ROSES?

By S. MORRIS JONES, *Westgrove, Pa.*

There are many beautiful flowers, but I believe the rose holds now as it has held in the past, its place as Queen of the Flower Kingdom. Her supremacy is recognized by all classes of our people; her beauty is held as an emblem for comparison, as the highest standard of beauty; anything as sweet-scented is recognized as possessing the height of fragrance.

Almost by intuition it would seem, the minds of the boys and girls who live in the flowerless sections of our great cities are impressed with the idea that the rose is the most beautiful as well as the most desirable of flowers. I have been told by members of the Flower Missions that these children go wild over rose buds and frequently have to be repressed when they are being distributed to them, and that they will choose and be much better satisfied with one or two roses than much larger bunches of other kinds of flowers.

The Flower Missions are doing a noble work—the flowers they distribute carry with them much joy and pleasure and undoubtedly

tend to create aspirations for a better life. How those members of the Flower Missions who witness the joy that one little rose bud brings to the breast of the fortunate recipient must wish that there were "more roses."

The growing of roses is a large industry, millions of them are grown each year for outside planting, and millions of them are planted in parks and private gardens throughout the United States.

Our country is large, however, and although so many rose bushes are planted it is very noticeable as we pass along the streets of our towns and villages and of the suburban parts of our large cities that many of the lawns, I think I might say a large majority of the lawns, appear to have no roses in them. Many of the bushes that are seen are of the hardy climbing class, with the Crimson Rambler, a comparatively new rose more noticeable than any other variety. The hardy climbing roses are very desirable for many places, but they are not the most popular class of roses. We see more of them because they are nearly sure to live and thrive when planted, their vigorous habit of growth enables them to overcome the attacks of insects and fungus, the cold winter weather does not kill their branches and if planted in good soil they will live and thrive for many years without pruning.

The more popular bush or garden roses are planted in much larger quantities than the hardy climbing varieties, but the lives of many of them are very short,—not necessarily or intentionally so, but rather for want of a little timely care and attention, on account of which the enemies of the rose bush soon end its life. The list of roses that should do well in our gardens and survive ordinary winter weather is quite a long one, and while they will all thrive and do well in almost any good soil and favorable situation, there is no doubt that some varieties will do better in a particular kind of soil than others. Just what is in the soil to make this difference no one can certainly tell, but we can see by observing the growth of the plants just what varieties make a poor growth, and which ones produce unsatisfactory flowers,—these we should leave out of the collection for our own particular garden.

The rose can hardly be regarded as a fastidious plant, but it is a heavy feeder, the roots absorb a great deal of nourishment, which must be kept replenished by liberal manuring in order to get the best results. This is an important matter and can be better understood when it is known that the Hybrid Perpetual roses, such as Gen. Jacqueminot, Paul Neyron and Magna Charta, should make a complete new top each year. In other words when these roses are pruned in the spring all the old wood that has borne flowers the previous year should be cut out, and in its place there should be an ample number of strong young shoots to make a new top. If the old top is allowed to remain it appropriates most of the nourishment from the roots so that no young shoots are produced for the following year;—plants pruned in this way,—and I believe it is the way most of them are pruned,—soon lose their vitality and had better be replaced by young, healthy plants.

The pruning of the rose is a very important operation—all experienced growers agree on this point—and they also agree that it is difficult, indeed almost impossible to give definite instructions to the inquiring beginner or to those who are seeking to improve the

methods that they have been following. Each plant is a problem in itself, the eye must see it and it must be studied before the shears are applied, in order to obtain the best results. The one general principal to follow is to satisfy yourself which is the most vigorous part, and with this as a basis for the plants structure trim the weaker branches and cut back the stronger ones, having regard all the time for the shape of the plant. If it is your object to induce larger flowers and not so many of them cut back the stems severely, if you want a larger show of smaller flowers leave the stems or branches longer. The ever-blooming roses such as the Teas, Hybrid Teas and Noisettes require different treatment in pruning from the Hybrid Perpetuals. Their habit of growth is more bushy and branching, and they do not as a rule produce strong young shoots to take the place of the old top, so generally speaking the old top of these varieties should not be trimmed too severely, but the strong stems should be cut back slightly and the weak ones removed.

Roses have enemies and some of them are very persistent. The worst of these are the rose slug, the aphide or green fly, mildew and the leaf spot, commonly known as black spot. To destroy the rose slugs some kind of poison is used; white hellebore, Paris green and a preparation called slug shot are the poisons usually selected for the purpose. I decidedly prefer the white hellebore as it is very effective—much more effective than slug shot—and it does not burn the leaves as Paris green will do if too much is put on. A decoction made of about a tablespoonful of hellebore to two gallons of boiling water, applied when cold, is the most economical way to use it, but it can also be used as a powder or mixed with cold water. During the early summer when the slugs are the most troublesome and when they also do the most harm, it is a good plan to always have this poison ready for immediate application. Powdered tobacco or a strong solution of tobacco should be used to destroy the green fly; it must be remembered that the aphide or green fly increases with marvelous rapidity, and that prompt measures should be taken to destroy it, if tobacco cannot be had it is possible to kill a great many of them by rubbing them off with the fingers.

For the fungus troubles, we use powdered sulphur for mildew, but for the black-spot there does not seem to be any very effective remedy, fortunately the spot attacks the older leaves and if the plants are in vigorous growing condition they will not be seriously hurt by this disease.

I stated that the before mentioned pests are the worst enemies that the roses have, possibly I am wrong in saying so, it may be that the worst enemy they have is neglect, not intentional neglect, but the rose suffers just as much from its effects as if it were intentional. We are very busy people and it is often hard to find time to attend such things as looking after the roses in our gardens. Some of us scold ourselves for not having taken the time, for it requires but a few minutes, however there is always something else to do and the roses do not absolutely have to be attended to. If we could only persuade ourselves somehow to make it a point to attend to the roses with more care in the early summer and keep them healthy and thrifty at that time, we would have much better plants, for it is then that they need to make a strong healthy growth

so that they may have time to mature and harden before cold weather; and then if we get the bushes nicely started and have something pleasing to look at and to show, we are certain to make more effort to keep them in a vigorous, healthy condition.

In what I have said about the trouble that the rose grower may expect, and the remedies that he must apply to correct them, I hope I have not drawn a discouraging picture. The sum of these troubles no doubt gives us a most potent answer to the title of this paper, that is, the enemies of the rose destroy so many plants that we cannot expect to see more roses in our yards and gardens until the lovers of the rose learn to institute a more vigorous campaign against its enemies.

There is a bright side to this rose question in the form of many beautiful rose gardens, I have seen some of them and no doubt all of you have seen others just as beautiful; they are not always visible from the street, but are often located in some chosen spot just out of public sight. I do not mean commercial gardens, but refer to those that have been planted and cared for by the amateur. Some of the prettiest gardens I know of have been and are now cared for by very busy people, who will tell you that it does not take very much of their time to do the work necessary to keep the plants in fine condition, and that they as well as their friends get a great deal of pleasure from them all summer long.

In selecting rose bushes do not always insist on having hardy plants for there are many of the tender and semi-hardy ever-blooming varieties that will grow so well and bloom so continuously during the first season that I am sure anyone should feel well repaid for planting them even if they did not live through the winter. To get the best results the bed must be enriched with well rotted stable manure, cow manure being preferred. I am satisfied that this method of growing roses—choosing the ever-blooming varieties and replacing each spring any that may winter-kill—will become much more popular in the near future. Small own-root roses can be bought very cheap in quantities, in fact they cost very little more than other kinds of tender bedding plants such as geraniums and coleus. Do not suppose that these small roses will not grow into good sized plants and give you lots of bloom the first season, I can assure you that they will if you do your part in caring for them. In thus recommending the small rose plants it is not my intention to discourage people who prefer them, from getting the two year old plants. The two-year old bushes are better for immediate effect, but they cost much more than the one-year size—probably more than many people in our latitude would care to invest in semi-hardy rose plants.

A very good way to protect tender roses during the winter is to cover the ground around the bushes to a depth of five or six inches with leaves, tie the branches of each bush closely together, and put over each bush a keg, barrel or box with both ends knocked out; set the box or whatever is used so that the rose bush will be near the middle of it, then fill up the box with dry leaves, being careful to settle them down around the rose bush, then put a lid on the box to keep the rain and snow from wetting the leaves. If the bushes are very tender be careful to have at least six inches of

leaves all around them. Roses protected in this way are almost sure to pass our severest winters uninjured.

We occasionally have winters when many varieties are hurt amongst the hardy roses, and this sometimes occurs when the winter has not been a very cold one, just what causes the injury at such times we cannot always tell, but I think the sudden change from bright sunshine to cold and from cold to bright sunshine during the latter part of the winter is frequently responsible for it; a severe cold spell after the sap has been excited is also injurious. When the tops of the rose bushes are killed they may entirely recover if they are on their own roots, but when budded or grafted plants are killed down to the roots they are lost; on that account it is desirable to get own-root roses when it is possible.

There are in existence about two thousand distinct varieties of roses, and every year there are fifty or more new varieties introduced. Out of this large collection it is reasonable to suppose that varieties might be found to suit every lover of roses and every condition of soil and climate. If in the future we cannot say that there are more roses in our gardens and on our lawns, there is no doubt that we can at least say there are more varieties of roses.

A sample of a small one year old, own-root Tea rose bush in a 2 $\frac{1}{4}$ inch pot was shown; also a sample plant, showing the growth that a similar small rose bush had made in one summer. This bush was taken from a bed where 6 bushes of the same variety (Maddalena Scalarandis) were planted May 15. It was not the largest bush of the 6, but was chosen as representing an average size. It was a vigorous bush over 2 feet in height and was well branched. The roses in this bed had shown bloom continuously from June 25th to November 1st. Other varieties will do equally as well, and some that will not grow quite as large, will bloom just as long and as freely.

Being asked how to prevent mildew, Mr. Jones recommended an application of powdered sulphur. For Red Spider a vigorous syringing with cold water is an effectual remedy. This insect is generally worse upon plants that are not of vigorous growth.

A Member.—Is the dwarf "Crimson Rambler" desirable?

MR. JONES.—It is probably the greatest blooming rose we have. It will, under proper care, bloom all summer, or the entire winter.

The following communication was read by the President:

War Department,
Gettysburg National Park Commission.
Gettysburg, Pa., January 17, 1906.

To the Chairman, State Horticultural Association, Court House.
Gettysburg:

We wish to extend through you a cordial invitation to view the Gettysburg National Park, Exhibit of Maps, Etc., in third story Winters building, Chambersburg street, Gettysburg.

For the Commission.

E. B. COPE.
Engineer.

The invitation was received with thanks but could not be accepted by the Society for want of time.

The following was presented by the Secretary:

Harrisburg, Pa., December 29, 1905.

Enos B. Engle, Secretary State Horticultural Association, Box 76,
Harrisburg, Pa.:

My Dear Sir: I have just received circular of announcement of program for the January meeting of the Society. I doubt much whether I can be present, but matters may so shape themselves that I can be on hand at least a part of the second day.

While in Massachusetts last September, I visited Concord, and near that town succeeded in securing a small branch of the original Concord grape vine. I think there are two buds upon it that will grow. I shall take great pleasure in presenting it to the Association. It is almost impossible to secure any cuttings at all from this remarkable grape vine, but the lady in charge last September very kindly permitted me to break off the piece of the vine which I shall present to the Pennsylvania State Horticultural Society.

Faithfully yours,

H. C. DEMMING,

In accordance with the foregoing communication, the branch was presented to the Society with the following note:

"Part of branch from the original Concord grape vine; taken from the vine, near Concord, Mass., Saturday, September 30, A. D. 1905, by H. C. Demming, of Harrisburg, Pa.

"Presented to the Pennsylvania State Horticultural Society, with the compliments of

"HENRY C. DEMMING."

The vine was accepted with thanks in behalf of the Association, and the Secretary was authorized to write Mr. Demming in acknowledgment of the same.

Adjourned.

EVENING SESSION.

Mr. Brown, chairman, submitted the following:

REPORT OF COMMITTEE ON NOMENCLATURE AND EXHIBITS.

Mr. President and Members of the State Horticultural Association of Pennsylvania:

Your Committee on Nomenclature respectfully reports that we have carefully as time would permit, examined the Exhibit of Fruits and Flowers, and take pleasure in commending the exhibit as a whole.

A notable feature of the exhibit, and one to which special attention must be called, is the almost entire freedom of the effects of fungus or the ravages of insects on the fruit exhibit, representing as it does, care in orchard management especially in spraying. The quality, uniformity in size, and high color of the apples of Central and Southern Pennsylvania, are a surprise to those not acquainted with the fruit of this section, and must attract the attention of fruit growers, so that the industry in this section has a promising future.

We suggest to this Association, that it establish a rule, that in the future exhibits of the Society, all imperfect fruit be disbarred from the exhibition tables. Let the State Horticultural Association of Pennsylvania take the lead of the fruit associations of this country in this respect and establish a standard that others can well emulate.

We find there is on exhibition by C. J. Tyson 27 plates containing 7 varieties of apples, two jars of canned York Imperial apples, and one glass jar of jelly made from the parings of the fruit comprising the two jars of canned apples. This exhibits the complete utilization of the product. The special feature of this exhibit is the beautiful York Imperials shown as the perfection to which this fruit can be grown in Adams county.

Geo. H. McKay exhibits one plate of Delaware grown Stayman, and one plate of Ben Davis kept two years in cold storage.

D. C. Rupp exhibits four plates of four varieties. He exhibits a seedling that in size, color and flavor is promising.

John F. Boyer exhibits four plates, four varieties, that were absolutely perfect and had not been sprayed. This fruit, however, is grown in an isolated section, and upon small areas, which is important in that there are still many such conditions in Pennsylvania where apples may be grown for a limited period, at least free from some of the worst difficulties that confront the fruit grower in sections where similar conditions do not exist.

John Kready shows one plate Sheldon pears, three plates of apples.

Miss Mary M. Haines exhibits one plate apples, one jar figs. W. H. Black, two plates apples.

W. S. Adams exhibits nine plates apples, seven varieties.

President Hiester, 15 plates and 10 varieties apples, 2 plates Lawrence pears.

These two last named exhibits deserve special mention on account of high color and freedom from imperfections. In Mr. Hiester's exhibit we note peculiar form of Smith's Cider apples which is instructive in that it represents the possibility of such varieties even in standard varieties that oftentimes makes proper identification extremely difficult. The total exhibit is 77 plates and 40 varieties.

John G. Rush, West Willow, Pa., has a very creditable exhibit of 15 varieties of nuts. His Persian walnuts, "Franquette," "Mayette," and "Rush Hybrid," a Pennsylvania seedling of his own production, are fine in appearance, of high quality, and are perfect blossom; an important feature in nut culture.

Henry Eicholtz, Waynesboro, Pa., exhibits a collection of carnations, among which is a beautiful seedling of his own creation,

named "Mrs. W. T. Omwake." He also shows the "Thos. W. Lawson," and recent creations in white, red, pink and variegated colors.

We report this exhibit as a whole to be a very creditable one and such as should encourage increased efforts on the part of the Society.

We suggest that the Society offer a certificate of merit as premium for the exhibition of meritorious fruits; believing that this would increase the interest in these annual exhibits.

Respectfully submitted,

A. N. BROWN,
DR. I. N. MAYER,
D. C. RUPP,
Committee.

The CHAIR.—In the report just submitted Mr. Brown has made a suggestion worthy of consideration, and I hope that it will be considered by this Society. I refer to the question of premiums for exhibits. I hope some one will make a motion so that the matter may be taken up for discussion.

MR. BROWN.—I move that this Society be authorized to offer certificates of merit to worthy exhibitors. In our Home Society we did not have sufficient funds to offer cash prizes and in order to encourage exhibitors we gave certificates of merit which to many were of greater value than cash premiums. I have just received a letter from my son who has been attending this week a meeting of the Peninsula Horticultural Society, and he states that one exhibitor had two 60 foot tables covered with his own display of fruit. We have had exhibits of as many as 1,000 to 1,200 plates of apples. I would suggest also that at future exhibits all imperfect fruit be debarred from our tables. We don't want to encourage the growing of imperfect specimens. We are the best people in the world and deserve the best that can be had. I realize that this is a new departure for this Association and I hope no action will be taken without discussion.

The CHAIR.—I have noticed for several years that usually the best plate of peaches was grown in a village lot, and the best plate of quinces was always grown in a village lot. I am in favor of according to such exhibitors some kind of recognition, and we could better afford to give certificates of merit than cash. I can hardly agree with Mr. Brown that all imperfect fruit be debarred at our exhibits. Sometimes such specimens serve a valuable object lesson by way of comparison.

Mr. Brown's motion was adopted and the matter was referred to the Executive Committee for arrangement of details.

The CHAIR.—We have as a guest of this Association Mr. Skillman, President of the New Jersey Horticultural Society. He has been very quiet since he is here and few have known of his presence. We will have the pleasure of hearing from him.

MR. SKILLMAN.—I have been having a good time since I am here and would rather listen than talk. I am glad to be with you and am here because I want to be. Our New Jersey Society wanted to send me elsewhere, but I preferred to come here because I had been at the Bendersville meeting and wanted to return to see and

shake hands with my friends from there especially the Tyson family. They are all kind and hospitable and cannot help it. I also met your President there, and had him come to our meeting in New Jersey, where he made a good speech.

Another reason why I came here was to see this old and historic town which figured so prominently in the Civil War. You have had a good meeting and a splendid exhibit, and I have found your discussions interesting and instructive. I believe in visiting meetings of this kind and in an interchange of courtesies among our societies. We ought to co-operate and work in harmony because much can be accomplished by co-operation and united efforts. If we act as one body we can generally get what we want. Rural residents are about the only people who do not act in unity for what they want. Fruits should have a protective tariff, and our produce should have protection as well as the products of our manufactures. Foreign fruits come in direct competition with our own. Owing to freight discrimination California growers can sell their fruit at a profit in competition with our eastern fruit. They can grow it cheaper than we, and the government aids them in irrigating their lands free or at a nominal cost. We should unite also in a demand for a parcels post, and with rural mail delivery we would be brought in closer touch with merchants in large cities. We need laws also to protect us from the modern automobiles, who drive so recklessly over our public roads endangering life and virtually driving your wife and daughter off the road for safety. We have in New Jersey a law which does not permit us to protect our property from birds. I do not believe such a law is just. We can protect our homes or our stables from thieves and robbers, but dare not protect our orchards or gardens from destructive birds. If we shoot or kill one we are liable to a fine of ten dollars. A man near Boundbrook found a young robin one day that had been blown out of its nest by a storm. A little girl kindly took the little bird into the house to feed and care for it and for so doing was fined twenty dollars by the deputy game warden. An extensive pea grower said the birds destroyed for him one season a hundred bushels of peas worth two to three dollars per bushel. These are evils that should be remedied and by co-operation we may be able to obtain redress.

There are many ways in which we can benefit by a cordial co-operation. It encourages a kind and sympathetic fellowship that makes the world a kin. We should all be bound together and work together for the common good.

The following resolutions were adopted:

Whereas, The fruit interests of Pennsylvania are of great importance and demand proper development and can be developed only by the State giving them the recognition and interest they deserve; therefore, be it

Resolved, That we the members of the State Horticultural Association, do hereby express our earnest desire for the next State Legislature to establish a Division of Horticulture of the Department of Agriculture, to give us needed help with varieties of fruits, methods of cultivation, fertilization, pruning, thinning, harvesting crop, packing, storing, shipping, combating diseases, etc.

Resolved, That we shall ask our legislators and all possible kindred societies to work for the establishment of such an office, properly filled by a competent horticulturist.

Whereas, We, the members of the Pennsylvania State Horticultural Association, realize the need of pure materials in making fungicides and insecticides and desire and need legal protection in this regard; therefore, be it

Resolved, That we urge State legislation providing strictly against the adulteration of materials sold as fungicides or insecticides in this State.

Be it further Resolved, That we shall place this subject before other Horticultural and Agricultural Societies to secure their aid in suppressing the sale of adulterated insecticides and fungicides.

MR. SKILLMAN.—We also want a uniform package law, which should be the same in all states. As it is now Delaware has one standard for fruit packages, and New Jersey another. There should be a law so strong that there could be no evasion and all should be compelled to use the prescribed legal packages.

Mr. Brown and Mr. Tyson also favored the enactment of such a law.

The following resolution was read and adopted:

Resolutions Concerning the San José Scale.

Whereas, The San José Scale has invaded our community to a worse extent than was believed until the State inspectors commenced to examine our trees, and

Whereas, We have been helped by the efforts of Prof. H. A. Surface, State Zoologist, and have confidence in his methods; therefore, be it

Resolved, That we, the members of the State Horticultural Association, do hereby express our appreciation of the labors of State Zoologist Surface and his inspectors and demonstrators; and further express to the Governor our thanks for the help he has given us by appointing such men to these important offices and ask continued support for them in their important line of work, and recommend them to the confidence of the public.

MR. C. J. TYSON.—I would like to hear from Mr. Brown on the subject of spraying and spray mixtures.

MR. BROWN.—I have had some experience in this line and am sometimes called a Lime, Salt and Sulphur crank. I have used this wash most extensively and have had considerable success with it. Have also used 'Kil-O-Scale' with some success. Last fall I used 'Scalecide' and found it very effective. I applied at the rate of 1 part to 20 of water. Made application last week in November and upon examination ten days later concluded that 80 per cent. of the scale had been killed. Three weeks later nearly all were killed; subsequent examination show that results were satisfactory. One report read here to-day claimed that 96 per cent. had been killed with it.

We are destined to have more trouble with the San José Scale in the future than we have had in the past and are looking for some cheap and efficient wash that will do the work, and be more con-

venient to handle and prepare than lime, sulphur and salt. If I were to live twenty-five years, and would be obliged to grow fruit by spraying with lime, sulphur and salt, I think I would go out of the fruit business.

If the soluble oils can be furnished at a reasonable price, and their continued use does not prove injurious to trees, they are destined to come into popular favor. I am hoping that they will prove the 'Moses' that will lead us out of the wilderness.

MR. McMILLAN.—I have been much interested in Mr. Brown's remarks since I have had some experience in the use of the different spraying materials. I have used the soluble oils, and while I have seen some good results where strong percentages were used, on the whole, they have not proven so effective as the lime-sulphur-salt. I have had first-class results with the latter material on peach and plum especially, though not quite so good on apple. On peach trees near Harrisburg, sprayed last week of April, 1905, with regular Lime-S.-S., it was impossible to find any young crawling scale in July and August. These trees were badly infested with living scale before spraying. I do not see what better results one could expect than this. Mr. Brown speaks of killing 95 per cent. to 97 per cent. of the scale with soluble oils. If one per cent. of the scales on a moderately infested tree be left alive the results may not be considered satisfactory, and in some of our experiments less than one per cent. were left alive. Five per cent. or even two per cent. of live scales remaining on a tree will be sufficient to reinfest it badly by September or October.

I have been in Blair county recently where there are a number of orchards containing from one to five thousand trees and where they have been spraying with the lime-sulphur-salt wash, there is little or no scale. In addition to being an effective insecticide the L.-S.-S. is a valuable fungicide, as we heard Prof. Waite declare in his lecture. This was very evident upon the trees in Blair county from the appearance of the foliage and general condition of the trees. The bark was bright in color and smooth in appearance, with none of the characteristic brown blotches of the *Monilia* or "Brown Rot." Near Frankstown, Blair county, the owners of a large orchard have sprayed their trees regularly every spring with L.-S.-S. There is no scale to be found on them but the owners declare they will continue to use this material every year simply because of its value as a fungicide.

One great objection to the commercial oil preparations is their excessive cost, which operates against their introduction for general use. It seems unreasonable to sell a preparation of this kind, that is nearly pure oil, at \$1.00 to \$1.50 per gallon when refined petroleum can be bought at 15 cents a gallon retail. Even when sold at 50 cents, the mixture when diluted will be more than twice as expensive as lime and sulphur, and this amounts to quite an item in large orchards. Many persons hesitate considerably on the expense of spraying. I have heard Prof. Surface and others express their opinion that nearly all of these ardent advocates of commercial insecticides are interested directly in a percentage on their sales. It would also seem so in this case. Further careful experiments will be made however, and if it can be proven that the oil remedies are as

effective as L-L-Salt, they will doubtless come into more general use on account of their convenience. There are several reasons why Prof. Surface is recommending and using the Lime and Sulphur Mixture in his demonstration work throughout the State. In the first place the materials can be obtained in every locality at comparatively low cost and every one is familiar with them. In the next place, the wash is easily prepared. As Prof. Waite has said: "There is no great mystery about preparing boiled lime-sulphur-salt." It can be "slung together" quickly in almost any approximate proportions and if boiled thoroughly, for an hour or more, will do its work.

I met some men who used the self-boiled mixture on a number of plum trees early in November and when examined six weeks later they found only 10 or twelve live scale on each tree. This material was prepared in a barrel and such care taken to conserve all the heat that it was really more trouble than boiling in a kettle. It is not hard to apply in spraying if well strained, and it will certainly do the work. This is the concensus of opinion from all the experiment stations in the U. S. when it has been tested, which is more than can be said for some of the soluble oils, or any other material. Another very good reason we recommend L-S-S. is on account of its absolute harmless effect on all kinds of trees in dormant condition. Oils of any kind are dangerous in the hands of an inexperienced person, and a large number of our farmers who want to save their trees have never seen a spraying pump. There are other good reasons why we use and recommend the L-S-S. mixtures, but I have given you enough to show our position on this subject.

MR. BROWN.—I do not want to be understood as taking exception to the use of Lime-sulphur and salt. Prof. Surface has assumed a wonderful responsibility that will require signal ability—and he has done, and is still doing his work well. His organization is superb, and for his purpose the Lime-sulphur wash is the best and safest material he could use, and I would have done the same under similar circumstances. However, there is a demand for a spraying material that is more conveniently handled and applied than this mixture, and that can be sold at a reasonable price. The expense of the oil mixture is more apparent than real. They cost more per gallon, but it must be remembered that their spreading capacity is forty per cent. more, and that they are more easily applied. I am expecting that we will yet evolve a soluble oil mixture that will really be cheaper than anything else, and that will prove entirely satisfactory. Until then the Lime, Sulphur and Salt wash must stand as the sovereign remedy.

The following resolutions were read by Mr. Hartman and unanimously adopted:

Resolved, That the State Horticultural Association desires to express its sincere and hearty thanks to the Commissioners of Adams county for their interest and kindness in granting the use of the court house for our meeting; also to the Fruit Growers' Association of Adams county for its valuable aid in making such a success of our meeting.

Resolved, That this Association commends especially the fine display of fruits, cut flowers and potted plants, and extends heartiest thanks to the members and friends who have given such great care and assistance in bringing and arranging them.

Resolved, That the Association greatly appreciates the assistance rendered by the experts and specialists who have helped to make this annual meeting interesting and profitable.

(Signed)

D. M. WERTZ,
D. L. HARTMAN,
D. K. McMILLAN,
Committee.

On motion, the Association adjourned.

ENOS B. ENGLE,
Secretary.

PAPERS SELECTED FROM THOSE READ AT FARMERS' INSTITUTES, SEASON 1904-1905.

THE NECESSITY AND VALUE OF AN EDUCATION.

By PROF. G. M. BARKER, *Warren, Pa.*

One of the most binding duties which faces the youth of the present age is that of securing an education. No man can expect to become a power in the world who does not develop his intellect to the fullest capacity. The aim of education is to develop a noble type of manhood. Man has various duties to perform in the world which require special training and a wide range of knowledge. Hence it is clear that education both in its subjects and methods of instruction should have some reference to the demands of a practical life. Human development should be combined with practical wisdom. The school should be a natural introduction into life. This is the view of Milton, who said, "I call a complete and generous education that which fits a man to perform justly, skillfully and magnanimously all the offices, both private and public."

Herbert Spencer presents the same very forcibly. "How to live," he says, "is the question. Not in a material sense only but in the widest sense." The general problem which comprehends every special problem, is the right rule of conduct in all directions under all circumstances. In what way to treat the body and mind, in what way to bring up a family, in what way to behave as a citizen, in what way to utilize those sources of happiness which nature supplies. How to use all our faculties to the greatest advantage to ourselves and others. How to live completely. This being the great thing for each one of us to learn, consequently this is the great thing for education to teach. The destruction of learning would bring with it the ruin of every thing that is good. The better a man is the greater his ardor for the preservation of learning for he knows of all plagues ignorance is the most pernicious. To neglect the youth in our schools is like taking the spring out of the year. At no time during the history of the world has the young man had as many advantages in securing an education as at the present. Poverty is not a bar to learning. Many a man who reached the highest eminence learned his letters by the flickering light of a log fire. Brain developed is the power which is seen and felt everywhere. It is that which brought Mr. Lincoln from the swamps of Illinois to the White House. It is that which led Benjamin Franklin from the printer's desk to the courts of kings. It is that which transferred Roger Sherman from the cobbler's bench to the Halls of Congress. These are illustrations of a developed brain which will

lift a man from the lowest ignorance and poverty in which nature may have placed him at birth. Neither can we say physical infirmities are a bar to learning. Homer and Milton were blind. Helen Keller, who recently finished a four years' college course at Radcliffe, one of the most complete of ladies' colleges, was born blind, deaf and speechless, but nothing daunted by these infirmities, she pressed forward to the goal, her ambition and graduated well up in her class, leaving college mistress of five languages. The value of Miss Keller's education devoted to the noble purpose of instructing those who have been as unfortunate at birth as she, can never be measured in this life.

The young man must understand that in college or in any institution of learning that the cultivation of the mind is the absolute demand of the day and hour. To-day the world will only have high grade ability to undertake her enterprises to guide her institutions, to run her machinery, to be leaders of her multitudinous affairs. Money may have power, birth and blood may have power, but brain is mightier than all. An education is the greatest of all wealth. He who secures it has something which the world cannot take away from him. Stocks and bonds may rise and fall but an education is always above par.

Not long ago Booker T. Washington, undoubtedly the best educated negro in the world, a man whom President Roosevelt deemed worthy to dine with him at the White House, sent out eleven questions relative to the education of the negro. These questions were sent to representative white men of the South, who were able to speak from observations in their own communities. Among some of the questions were the following: (a) Has education made the negro a more useful citizen? (b) Has education improved his morals? (c) Does crime grow less as education increases? (d) Has education made him more economical? Dr. Washington received an average of 106 answers favorable to the education of the negro, 13 unfavorable, while an average of 17 failed to answer. The ratio as you can see, was 8 to 1 in favor of education. Then can we not logically conclude that the solution of the race problem lies in the education of the negro coupled with Christianity? By the dissemination of growth, intelligence, bitterness of sectionalism and rancor of sectarianism is rapidly disappearing and a better citizenship and a more healthy and robust nationality is asserting its presence and influence in the world. Japan, the most enlightened of the far Eastern countries, has adopted the plan of the American public school system. Formerly the wise men came from the East, but to-day the Orient in search of wisdom has turned her face westward and to-day American genius and intelligence are on their first proud march around the world. The minds that are to control the next quarter of a century, settle all the disputes which may arise, meet all the issues which may present themselves and give a future to this republic are in the colleges, academies, public schools, in the factories and on the farm. To form these minds aright is the delicate but responsible task of the fireside and institutions of learning. Sound learning means safety to the child, to the city, to the nation. The institution which stands for sound learning is not simply an ornament, but a power which exerts a mighty influence for the advancement of mankind. To make men for the hour is the

grand business of popular education. Well would it be with each boy and girl were they to follow the motto which placed Mr. Lincoln in the presidential chair, namely, "I will get ready." For in the not far distant future from youth two pathways open, one leading to the highest pinnacle of fame, the other to degradation and want. Those who are prepared are bound to succeed. The world steps aside to let them pass.

AGRICULTURE ABROAD.

By JAMES ROUNDSLEY, *Millerstown, Pa.*

In the summer of 1901 I decided to take a trip abroad and left here on the evening of the tenth of July. Precisely at noon the next day we left the Hoboken pier on the magnificent steamer "Deutschland." In the early morning of the 17th, we found ourselves sailing along the beautiful coast of Cornwall, with its majestic hills and cliffs, beautiful foliage and fine castles. We landed in Plymouth in time enough for breakfast, after a trip of five days, nine hours, thereby beating the world's record, and which took me over 20 days to cross in a steamboat 36 years before. So much for the ingenuity of man.

Plymouth is a beautiful city, and right here is where the Puritans sailed from in 1620, in search of a new home and country. The very spot where the Mayflower started from is marked with a beautiful tablet. Plymouth has a very fine harbor and it is said large enough to shelter the whole English fleet. The one thing that took my attention while there was the great amount of dairy products. In nearly every square, cream, junket, etc., was for sale, and I was told supplies were brought in from the country twice a day. Plymouth being our base for three weeks, we branched out to see the country in different directions, and the first thing I noticed that took my attention specially after getting outside of the city, was the grazing of the largest and finest looking cattle I ever saw and called my son's attention to look out of the car window and notice the fine cows. I soon learned that the dairy was one of the principal sources of revenue for the west of England farmers. They are very careful and take great pride in all their live stock. They learned long ago that their country is small and they cannot afford to have it over-run with dunghill and worthless cattle. To stimulate the breeding of good stock, horse and cattle fairs are held in various localities in the same county, and good prizes are given for the best animals after competent judges have decided.

Not only so are they interested in the good breed of horses and cattle, but in all the animals necessary on the farm. One day at Lydford, Devonshire, we attended a horse fair. This place is a country village, lies at a junction of three railroads, and thousands of people attend it. Outside of the fair enclosure was an open

space which resembled a prairie, and is known as a part of the Dartmoor lands, a lot of flags were stuck around on poles for a distance of about a mile and a half, and a prize of \$2,500 was offered to the owner of the shepherd that would take a flock of sheep around these flags in the quickest time. I had the pleasure of seeing the dog and talking to the owner after the prize was won. Nearly all towns, big and small, have their market houses, and once every year each market have their own special day when prizes are given for the best dressed beef, pork, mutton, poultry, etc., and owing to their salubrious climate and pure atmosphere, meats can hang on the hook in the butcher's shop all day long during the hottest days of the summer, scarcely a fly to be seen. Go where you please when you pass a butcher shop the meats are exposed in the front large windows on the hooks with the price attached, and the cheapest piece of pork that I saw was 15 cents per pound retail. England's beef is known the world over for its quality and juicy nature. But unfortunately for them they cannot raise enough for themselves. One day while in London I was joking a Londoner about the condition of their teeth, more mouths devoid of some of their teeth than I had ever seen, and that I had only seen one dentist shingle in the whole of London so far as I had gone, and had traveled many miles of their streets. He said we will give you that; America is the home of the dentist, and says he, "Do you know how our people got bad teeth? It is from eating your American beef." After informing him that they got our best, he said their native beef would bring from five to six cents per pound in the open market more than ours, which I afterwards found to be true. This man was anxious to hear of this country, and when I told him we had 100,000 pound cars and a four track stone arch bridge across a river a mile wide only 25 miles from my home, he said, "You have a great country, but you haven't any Towers of London. St. Paul's Cathedral or Westminster Abbeys. Give me dear old London."

Owing to the great demand for meats and dairy products in England, a great deal of pasturing is done, which makes farming a comparatively easy vocation. The majority of the farmers raise but a small amount of grain, more than will do them for their own use. One day we hired a team at a livery to drive through the country in the county of Devon, and in passing by the gate which opened to a field of oats, I was amazed to see the large clusters of oats and such a large grain. When I returned the horse and trap in the evening, for which I paid six shillings (\$1.50), I asked the proprietor what a horse like that was worth. He told me £60 (\$300); when asked what he paid for oats, he said 3 shillings a bushel (75 cents), but could get American oats for a half crown (12 cents), but it wasn't worth anything; too light. He said it was too much like their chaff. A very little hay is harvested and the little that is gathered is stacked and thatched outside. They can pasture all the year round, and it is a common thing to have a field in grass for a number of years, and the sod doesn't seem to wear out. Their grass is very nutritious. All the different grains, such as wheat, oats and barley, yield bountifully. The average of wheat during that year was 35 bushels to the acre. The farmer does not need to push his work hard in harvest because the season is long. The weather being delightful.

About the 25th of July I took a trip through the county of Cornwall on the London and Great Western Railway, a fine double track road that runs from London to Land's End, a distance of 325 miles, and along this road I saw the farmers cutting lovely fields of wheat with the binder (probably American). Two weeks later I went to London, a distance of 247 miles from Plymouth. We passed through the counties of Devon, Somerset, Wilt, Berks, Bucks and Middlesex, and from Exeter to London, a distance of 197 miles, our train did not stop, it being the longest regular scheduled run in the world. This part of England is a beautiful farming country, and we noticed a great deal of wheat being cut. It was such a heavy stand that I called my son's attention to the heads. The whole field looked like a solid mass. All stood up straight and had a striking appearance. In most instances the binder was at work with the old fashion sickle. I, however, think they were preparing for the binder. Ten days afterwards, while traveling on the London and South Western Railway from London to Southampton, I noticed them hauling the wheat in. It was then the 22d day of August. It should be understood that their country is devoid of storms such as are prevalent here, hence their grain stands up and ripens in good shape.

As stated before, the raising of stock constitutes one of the farmers' special sources of income. They, therefore, raise a great deal of vegetables, such as beets, turnips, carrots, etc., to feed during winter. It is a common thing to see at least one field on every farm filled with those vegetables, and owing to the nature of the climate, nearly all vegetables grow to perfection.

Some parts of England are noted for the high class of fruit grown, especially so in Devonshire, and there seems to be a good market for all kinds of fruit, nothing is left to grow wild, such as cherries, etc. It has to be fit for the market or come away. Cherries are picked and marketed with the stems on, and in that way retain their flavor. There were plenty of cherries during the whole of the six weeks I was there, yet the season was over at home before I left. The largest cherries we ever saw was in the London market. Strawberries and gooseberries grow very large and have a good market. Apples are highly cultivated in Devonshire, and their flavor has a world-wide reputation. Cider made out of those apples improves with age, and the price of a barrel of cider increases according to the years it is old. While in London I noticed in many different parts Devonshire cider advertised for sale. A market day in the town of Tavistock, Devonshire, we took dinner at the Queen's Head Hotel, and what was known as the market day dinner. Farmers lined the table and a typical "John Bull" farmer carved with the largest knife and from the biggest piece of beef I ever saw on a waiter. Cider was served to those who wished it. After dinner they all sat around the table according to their custom and enjoyed a glass of grog or a cigar, which went with the dinner. Price of dinner, a half crown (62 cents). The day was very warm for them and they appeared to be almost famished. I heard them say they had not experienced such weather for many years. An hour or so later we met the large gentlemanly farmer (who carved at the table) on the street, and he said, "You people don't seem to mind the heat." We told him no, it was very pleasant for us. I asked him what the thermometer stood, and he said, away up to 82. Says I, "That is nothing, two weeks ago I was where it was 105."

The next day I was at the Plymouth market, 16 miles away, and one of the other gentlemen readily recognized me, and bowed very courteously. Of course they all knew we were Americans, and everywhere they have a very kind feeling for us. Later on during the afternoon of that day, my son called my attention to some American officers on the leading thoroughfare of Plymouth. I at once rushed toward them and started a conversation, both parties being glad to meet some one from their own country. They were from the United States training ship Alliance, which was then anchored in the harbor.

The farmer of that country seems to be on top. The markets are of the best and I can best illustrate their condition in this way: I only met one person in that country who was related to me on my father's side, and that man was a second cousin, a man of 40 years, whom I had never seen before. He was born and always lived on the farm he now farms, about 10 miles from the city of Plymouth, and when we called on him on a Saturday afternoon, I found him, wife and five children, living cozy and well dressed, and when I asked him how he was getting along, he said, "First rate, cousin. You can see how we look." This man never knew of me and I met with him unexpectedly. Need I say it was but a short time till there was a good old English lunch on the table.

The wagon roads of that country are in the finest condition. Even the most unfrequented road or lane that I saw was so well macadamized that no wagon tire can penetrate at any season of the year. The railroads are all secured and fenced in, and all traffic is taken under or over the track. No person is allowed to cross it. I traveled 287 miles over the London and Great Western and never saw a solitary grade crossing. No matter how insignificant a way-station, all passengers cross the tracks overhead. Railroads are numerous and with their good wagon roads make it convenient for the farmer.

I have told you of the good side of the farmer abroad. There is one unfortunate thing for them which is, that their fields are too small. The hedges, I presume, were built more than a thousand years ago. They are at least six feet thick at the base and six feet high, and would require a wonderful amount of work to eliminate them. Those hedges destroy a great deal of good land and should not be more than one field where there are four. In the natural condition of things, farming is a very small affair in that country in comparison to what it is here. We have a stretch of country 3,500 miles from the Atlantic to the Pacific, and from the lakes to the gulf. The Mississippi Valley, which stretches from the Alleghenies to the Rocky mountains, and from the Canadian line to the Gulf, is the finest stretch of agricultural land the world can boast of. In this country we have 5,000,000 farms. The earnings last year from those farms according to the report of the Secretary of Agriculture were 5,000,000,000 of dollars. When in England I could always strike the ocean in 100 miles or less. I have traveled through the length and breadth of England and walked through the great city of London, have viewed the landscapes of Scotland and traversed the streets of Glasgow, the cliffs of old Ireland and the once besieged city of Londonderry, have seen the hills of France and the cities of Napoleon, yet nothing did I see that I would ex-

change for my own home in this country, "the home of the brave and the land of the free."

THE REAL FARMER.

By LOTTIE KEMMERER, *Bethlehem, Pa.*

There are quite a number of jokes cracked at the expense of the farmer or the "Reuben" as city folks delight in styling him. But, after all, the cities are crowded with more genuine Reubens—two to one—than can be found out on God's broad acres.

Look at the lists of financial wrecks strewn along the shores of the city. See the thousands who are "taken in" by get-rich-quick concerns, by wild-cat schemes, by foolhardy speculations! Who are these victims? Where did they come from? Born and raised in the backwoods, and this their first experience at "making money without work?" You might think so, but the truth is they are city-bred and have been raised on the very threshold upon which they met their Waterloo. They are the men who paint the farmer in all sorts of comic dress and manner; they are the ones who imagine that the farmer is lacking in brain power, and that the life he leads is one continual happy-go-lucky affair—an occupation that requires no study and which only calls for muscular labor.

The fact that a man was born and raised where brick houses and pavements predominate, is no more proof of intelligence than is ignorance established by birth on a farm. As an unknown writer puts it, "The farmer of the stage and of the humorous press is about as near like the real farmer as the caricatures of 'Uncle Sam' are like the real Americans. The man who buys the gold brick is not the ungrammatical scarecrow in cow-hide boots and ragged hat, 'with a little bunch of whiskers on his chin,' but the man who thinks the modern farmer looks like that."

The truth is, the American farmer is up to date, and in most sections enjoys most of the conveniences of the city, and these, too, coupled with advantages that city folks do not have. Electric lights and gas companies are extending their lines to the rural districts; the electric cars go by the farm house door; the telephone is found in the country home, and the free delivery brings the mail direct. All these conveniences are costly in the city; they are comparatively cheap on the farm.

As the prosperity of the country is measured by its crops, the farmer surely hold the entire situation in his hands. Who is to be pitied? He who is free and independent, who enjoys a purity of food, of water, of air, of life? Or, he who is a slave to others, who is compelled to eat food and drink water that savors of contamination, who breathes in his lungs a polluted air, and whose life is one beset by temptations? Is it hard to determine who is to be pitied?

The farmer, as a rule, is a cautious individual, does not gauge his work only for the present, does not provide only for to-day and let to-morrow take care of itself, but provides for the future, not only for himself, but for future generations. The prosperity of the

country is largely due to his planning ahead. The apples we eat came, perhaps, mostly from the trees our fathers or grandfathers planted, and these trees are living monuments to those who showed their unselfishness in providing for others as well as for themselves.

Where can we be nearer to Nature than in the country? Is it not the source from which poets get their material to put in beautiful verses? Isn't it the place where the famous painters go for a beautiful view which they later paint on canvas, and by mixing brains with colors produce a picture bringing thousands of dollars? These very pictures adorn the homes of some of the wealthiest people in the city.

AGRICULTURAL EDUCATION.

By H. O. SAMPSON, B. S., B. S. A., *Instructor in Agriculture, at Waterford, Pa., High School.*

The subject of education should never fail to interest an assembled audience. We are to consider this evening for a short time an especially interesting phase of this subject, namely, agricultural education. Work along this line is comparatively recent. A few years ago a father did not think his son educated unless he attended college and took up the study of the leading professions. Times have changed in this regard. We can not all be doctors or lawyers. The American people are becoming practical,—and we may now justly claim to be the people who do things.

In our leading universities and colleges to-day, we find boys not only studying the classics and other book-learning subjects, but find them delving into the mysteries of science and learning to apply them. "Science with practice" we may call this kind of education. As I have said, educational work in agriculture is recent. Most of the instruction at the present time is of a college grade. In each state the land grant institutions offer a course of study in the natural sciences relating to agriculture. Coupled with the work of instruction we have the State Experiment Stations. Each station receives \$15,000 from the National Government annually for investigation purposes. To this \$15,000 many of the states have added liberally, until in some institutions as much as \$50,000 is expended each year in this work. The results of these investigations are issued in the form of bulletins and reports that may be procured free upon application to the directors of the several stations.

The number of persons engaged in educational and research work in agriculture in the land-grant colleges and experiment stations in 1903 was 4,359. The lines of study may, in general, be included under the four heads: Agronomy, Animal Husbandry, Horticulture and Dairying, with separate instruction in Agricultural Chemistry, Zoology, Botany, etc. In agronomy, the students have work in field crops, including variety tests of grains, the grading and judging of grains, plant breeding, pollination, best methods of planting, cultivation, etc. Also work in soils, treating of their formation, constituents, adaptability to certain crops, food elements needed by the plants, fertilizers, their use and their misuse, effect of tillage,

drainage, mulching, etc; together with the above are considered the adaptability and construction of the different classes and kinds of machinery.

The work in animal husbandry includes a critical study of the different breeds of live stock, treating of the work of the prominent improvers of stock, as Bakewell, Booth, Bates, Watson, etc; also the care and management of stock, setting forth the good and the bad points to be considered, the judging and grading of animals, their feeding and nutrition qualities, their use to man and adaptability to farm operations. In horticulture, are considered plant propagation, budding, crossing, spraying of fruit and ornamental trees, hybridization, use of fruits, care of trees, forestry considerations, etc. In dairy work, the cow is considered as a highly specialized animal for the conversion of coarse feed into food forms for man. The studies include milk secretion, separator processes, butter and cheese making, dairy buildings, etc. Thus we see that many branches of study are taken up. In any exhaustive study we may call upon science to aid us. The better knowledge of the natural sciences one may have, the better will he see the "why" of farming operations. There is really no "science of agriculture." The day of the book-farmer is past. Farming is a good common sense business practice, and one on which a deal of hard work must be expended. Science merely aids the farmer, and if this aid produces grain we Americans are all desirous of knowing about it.

All of our boys cannot go to college, however; hence to reach this class, agricultural instruction is being offered in many secondary schools, including high schools, normal schools, academies, etc. It is hoped by this means to create a greater desire for farming as a business. Many boys now go to the city that might much better stay in the country. Men are beginning, however, to see the advantages of a country life, and we find people from the city now coming to the country. The work in the secondary schools is in its infancy, but we all hope to see it develop. There are many difficulties to meet at present. First one is, that it is new, and the conservative farmer is loth to take hold of it; second, there is a marked deficiency in suitable text-books; and third, a lack of properly trained teachers. But these difficulties are being remedied. The people are beginning to favor the work, text-books are being published, and young men in our agricultural colleges are preparing themselves as teachers.

In some of the states, legislation has been brought to bear, and many such schools are receiving state aid. In Wisconsin two counties have secondary agricultural schools, and at the last meeting of the Legislature provision was made for the establishment of more of these schools. In some parts of the country private schools are taking up the work, and are meeting with marked success. In a few years, therefore, agricultural education in our secondary and public schools will not be uncommon, and it will result in much good.

In your own high school a course has been established. For the first year the work will, of necessity, be of an interest creating nature. It is being carried on by means of lectures and text-book instruction. As I have said, the text-books are at present not well suited to the conditions, but with a certain amount of explanation by the instructor, the pupils are, we hope, deriving some benefit. An interest in the work is being shown. Even the girls show a

liking for the courses in agriculture. This is not unnatural, for what can be more instructive than any study dealing with Nature? Some of the lines being investigated are, soil studies, plant growth, the breeds, care and management of farm animals, forestry considerations, adaptability of crops, etc. This work is given mostly in the form of lectures. We hope, however, to see its future development, and trust that we shall not be disappointed in this respect.

We want the boys to see the advantages of agricultural pursuits. We want them to see the "why" of Nature. In doing this work we want your aid. Try and help us create an interest, and to show the boys that farming is not such a bad business after all, and a little later in the winter when we call upon you for a good practical talk on farming operations do not disappoint us. Let us work together, for only by so doing can we secure the best interests, and keep the boys on the farms, thereby benefiting agricultural work in general.

AGRICULTURAL VS. THE INDUSTRIAL AND COMMERCIAL SUPREMACY OF THE REPUBLIC.

By H. E. MOATS, *Jamestown, Pa.*

Mr. Chairman, Ladies and Gentlemen: At the battle of the Pyramids, Napoleon rode in front of his soldiers and with uplifted hand pointed to the top of the nearby pyramids and said: "Soldiers from the top of yon pyramids forty centuries look down upon you." At the close of the Spanish-American war a new epoch opened to the United States; an epoch of commercial and industrial supremacy, the formation of vast industrial corporations involving the outlay of capital beyond individual means and the consolidation of railroads into trunk lines, thereby reducing the cost of production and transportation to a mere fraction of what it had been previously. Almost at a single moment we saw our industrial influence only bounded by the world itself, we found that we could ship to the far east and sell in competition with the cheapest labor, and from a people that had been only guardians of their own welfare we suddenly sprang into international affairs. Like the star that settled down over the cradle of our Saviour, so has industrial and commercial supremacy settled down over this young Republic. Yes, indeed, the eyes of the world are turned upon us and we are occupying a most honored position. From the earliest recorded history of the dynasties of the Pharaohs down to the present time, there is a lapse of forty centuries, during which time the world has moved sometimes with leaps and bounds, then again it has been centuries passing a given point, just as man directed. We are living in an age, and especially in a country where progress is moving in at an unprecedented pace. We know what the past has been, or if we do not, there is no excuse for us not knowing. True, forty centuries are looking down upon our actions to-day.

To increase and maintain our present supremacy is the desire of every person who has the welfare of our people and nation at heart.

As this is a meeting in the interests of agriculture, it is necessary that I should direct my attention to that greatest of all industries—agriculture and its relation to other industries and the factors bearing upon the agricultural class.

In our trade with the world, if we removed the agricultural products from our exports we would owe over \$56,000,000, but including them the world owes up the enormous sum of \$367,000,000, or in other words, we supplied ourselves and then exported \$422,000,000 worth of products and yet it engages the attention of only three-eighths of our population. Such is the great importance of agriculture to our people. It is the farmer that balances the books with the outside world and steadily brings the wealth of other nations to our shores. To him we must look for the industrial and commercial stability of our nation.

The other industries depends for their welfare upon a store of wealth laid up by an all-wise Creator for the benefit of man, and when this store is exhausted they are compelled to move to new places. Agriculture depends, it is true, upon fertility laid up during countless centuries, but if worked judiciously it actually gains instead of becoming exhausted in a few short years. Therefore, it is the most stable industry engaged in by mankind.

The greatest problem of the American farmer to-day is, how to produce the greatest amount at the least cost or, as that old Latin maxim runs, "*Maximo in mummo.*" The railroad superintendent knows just to what fraction of a cent it costs to haul freight, while the manufacturer knows the cost of every part that enters into his product. Labor-saving machinery, it is computed, saved the American farmer the vast sum of \$1,700,000,000 during the past harvest, and only by its use are we able to compete with the world at all. But even beyond this is the greatest problem of all,—to know how. Recently a very complicated machine in a large factory ceased to do its work properly, the efforts of local talent could not repair it, and an expert was sent for, and in a few minutes after he arrived he had the machine in working order. He charged \$50.50, and when asked why he charged the 50 cents, replied, that "it was for actual work done, while the \$50 was for knowing how." Some may say that the public lands are almost all taken and the increase in acreage will soon cease. This is true, but the limit of production is not reached; 239 bushels of shelled corn, 68 bushels of wheat, 800 bushels of potatoes on an acre and 32 heads of cattle on 15 acres are certified possibilities, yet the average is not more than one-sixth of these figures. It seems we are only at the beginning of agricultural possibilities.

The farmers' institutes have been established over the greater part of the Union and other kindred institutions, as the Experiment Station, the agricultural colleges, and the agricultural press, to uplift and teach them the factors with which they have to deal and also to give them a knowledge of the outside world. There are many farmers to-day that are like what Edward Markham has fitly described in his poem, "The Man with the Hoe," in that much criticised line, "And they content just to be." They make no effort toward advancement. They are content to pass through the world in the easiest possible manner. While there are others that are like what John Milton feared when he wrote his sonnet on his

blindness, "They also serve who only stand and wait." But Milton produced after that two of the greatest poems in the English language, "Paradise Lost" and "Paradise Regained." To these two classes, if they persist, there is no hope.

It has only been during the last 50 years that there has been any effort toward agricultural education. It is only at its beginning. But during that time it has gone by leaps and bounds. Agriculture has awakened from its long sleep and it is my opinion that it is to-day the most promising profession. What has injured agriculture as an occupation in the past is the way that certain classes have looked down upon it as an inferior calling, and even to a certain extent, by the farmers themselves—that most any one could farm. But this, in the light of our present knowledge, is an exploded theory, and that farming needs more ability than any other calling. An agricultural educator recently said at a banquet given at Cornell University after the Governor of New York had signed a bill appropriating \$240,000 to the agricultural school, that "the farmer boy used to be looked down upon, to-day he was looked at, and to-morrow he would be looked up to."

During the limited time that is allotted to me to speak this evening, I can only mention the ideas that I would like to describe more fully but time forbids.

That which I wish to place emphasis upon is, that the farmer must become educated, in not only his own work, but in the general knowledge of the world. By this means he will become a force in the affairs of state as well as his own. He will not be looked down upon but will grace the occupation that he has so nobly chosen, like Cincinnatus, the Roman general, whom the Roman consuls went to, begging him to take command of the army against the enemy. They found him plowing in a field. He at first declined, but being urged to do so for the good of Rome, he accepted, defeated the enemy and saved Rome. Then the consuls wanted to make him Emperor, but he declined, saying that his farm needed his services more than Rome. This is one of the grandest examples written on the pages of history.

During the period of the settlement of our country, it mattered little whether the farmer had an education or not as he manufactured all he needed. The failure of crops in some distant country mattered little as he could not ship his products if he had any to sell. But how different it is to-day, with rural free delivery, the telephone and telegraph and fast trains. He is only a few hours distant from our large cities with all the advantages of their markets. The farmer is living to-day in that "Golden Age" which has served so often as the subject for school orations. Truly a new earth is dawning on the American farmer and the times demand that he be qualified to meet this new state of affairs. It is to-day, as it will be in the millenium, when we compare the present with the past: "The former things have passed away, and all things have become new." The resources of our American farms are wonderful when properly tilled and the demand is for skilled men to bring forth its hidden wealth, and education is the only means by which they may be able to accomplish the end. The farmer's life to-day is not what it has been, one of toil and drudgery; but on the other

hand, he shall become educated, enjoy the good things of this world and his work is not under a taskmaster, but he shall be free to do as he pleases. His work is, as Washington has fitly said, "The most noble, the most beautiful and the most useful employment of man."

So let us reach up a little further, search a little deeper, broaden a little here and a little there, and seek to be leaders in our day and age, and if you do your work nobly, your work shall be like that Spanish author has described, "Over which man shall shed his tears eternally and God his benediction." Think more of yourselves than you have before. Realize your responsibility and rise to meet it, with renewed strength, obtained by patient study. Remember that it is not a "theory but a fact that confronts us." Strive to accomplish more, to live better, to know more, to enjoy more, never forgetful that the proudest words that can be spoken of man is, "He has served his age and generation well," and when your work is done that you shall "Only be remembered by what you have done." You have promised to pay for value received and the world is expecting this of you. And may I say, lastly, but not leastly, that "Forty centuries are looking down upon you."

OUR OPPORTUNITIES.

By MISS ELLEN S. DAVIS, *Port Kennedy, Pa.*

"There is a tide in the affairs of men
Which, taken at the flood, leads onto fortune;
Omitted, all the voyage of their life
Is bound in shallows and in miseries."

Our opportunities are God's call to duty and action. If we ask the successful man or woman whence came their success, they will invariably answer, "By making good use of my opportunities," while the unsuccessful will say, "I was timid and hesitating, and while waiting to acquire more courage my opportunities passed by me never to return." How often we heard it said that had I known sooner such an opportunity I would have grasped it. Even in our everyday work we often see where a chance has been lost to do some kindness or say some encouraging word to our fellow-travellers. We know not how often we have helped some one by merely a kind word or bright look, helped them over some stony place in life's pathway:

"When over the fair fame of friend or foe
The shadow of disgrace shall fall; instead
Of words of blame, or proof of thus and so,
Let something good be said.

"Forget not that no fellow-being yet
May fall so low but love may lift his head;
Even the cheek of shame with tears is wet
If something good be said.

"No generous heart may vainly turn aside
In ways of sympathy; no soul so dead
But may awaken, strong and glorified,
If something good is said."

Many start in this life with no definite aim and no especial opportunity provided for them, but with unceasing energy coupled with a determination to be of some use and with the desire that they may make the world better for their having lived, accomplish undreamed of good. Booker Washington, for instance, began his life of service under very discouraging circumstances. Reaching an age when he began to feel his ignorance a disgrace, he determined to obtain an education. Walking to an institution of which he had heard, he finally secured admittance, and through his perseverance and integrity has gained a position of respect, not only from his own race, but from all his country. He it is that sees great opportunities for his people if they are trained to be good mechanics, thus becoming very useful to the world and consequently good citizens. It is true that many are born with few possibilities, but more waste possible opportunities and spend their time in complaining rather than in helping themselves and others. The world is vastly better for the life and work of Booker Washington, and there are many opportunities awaiting those who, like him, have ability and determination to use them. Certainly the lesson of his life is that opportunity waits for any man equipped for the task.

Do we appreciate our opportunities of to-day? Look how restricted the means for gaining an education were in the time of our grandparents or even parents as compared to now. If our boys and girls of to-day would only grasp every opportunity offered by the public schools they could enter their life's work with mind and hand both fully equipped. Free education is not charity, it is self-protection; for education lessens the needs of jails and police. Education is also one of the greatest enemies to war. If one-fourth of the money was spent in schools and missions that is used for warships, armies and navies the whole world would soon be better and there would be no use for these engines of death and destruction. Now, when all eyes are turned on Japan and the war which is waging between that country and Russia, we feel how wrong it is to sacrifice so many lives and cause so much suffering when it might have been averted, or settled by arbitration. What a wonderful opportunity the United States has in this settlement, for since the fall of Port Arthur and the talk of peace is in the air, the feeling in all Europe is that if an alliance be made between Russia and Japan the only nation that would be accepted as a mediator for peace proposals would be the United States. If our nation is asked to take such an important part in the settlement of this controversy, let us hope that she may act wisely! Baroness Suttner, known as the "Peace Angel of Europe," who has recently been visiting our country in the interest of peace, described America as "The land of the future, the land of unlimited possibilities. I would almost add," she said, "the land of impossibilities accomplished."

Do we in gaining our training for life's work, overcome so many obstacles as Helen Keller has done? Deprived of both sight and hearing she, through almost miraculous efforts of her own and the constant companionship of her instructor, has achieved more than any woman who ever lived, more than most men. Helen Keller is glad because "the spirit of civilization stands forth illuminating and enlightening those who walk in darkness and silence;" her heart is brimful of happiness because "in the midst of such mighty

achievements it is gratifying to know that man has not forgotten his weaker brother." How small our achievements seem beside that which she has done!

In this, our country, the poor and oppressed of other nations see a home full of possibilities for them. It is then our duty and work to see that they are properly trained physically, mentally, and morally, to become good citizens. Usually they are willing and anxious that their children should enter the public schools and have all the advantages which they offer. How patient we should be with these little ones, for indeed it must be discouraging and slow work for them, transplanted from their native country, to one of such different language and customs. "Plough deep while slugs sleep, and you shall have corn to sell and keep," said Dr. Franklin, and in every case this maxim applies to the success or non-success of the patrons of husbandry.

The farmer's son, impatient of the toil required for thrift and enterprise, forsakes the home of his childhood and seeks other occupations. If adapted to these, he succeeds, if not, he fails and misses his opportunity. And why should the farmer's son wish to leave the farm? Surely with the improved machinery of to-day his work cannot be so very hard. What if he does have to work early and late some seasons of the year, does not any one who wishes to succeed have to do the same? Take the young lawyer, if success crowns his efforts, he must work early and late, not part of the year, but all the time. In what occupation do we have so much freedom as that of the farmer? Out in the pure air and surrounded with the beauties of Nature the farmer boy can have good companions and good health, even if his bank account does not grow so rapidly as that of his friend, who, with pale cheeks, stands behind the desk of a crowded city office. The farmer now has every opportunity to educate himself, and even if he cannot take a course in agriculture, the national and state governments come to his aid, and send (for the mere asking) information on any subject he may desire.

It is good rather than ill fortune, sometimes, when the stern voice of Duty demands that the farmer's boy remain where God has placed him, and if prompt to improve the opportunities that lie around him, he becomes a noble representative of the type of manhood, thus described by the poet:

"He is a hardy, sunburned man,
But who can boast a hand so free
As he, the tiller can?
He trudges out at break of day,
And takes his way along,
And as he turns the yielding clay,
He sings a joyous song.
No summer heat, nor winter's cold
The power has him to foil;
Oh, far above the knights of old,
Is the tiller of the soil."

SOME SOIL PROPERTIES AND THEIR RELATION TO CROP PRODUCTION.

By H. O. SAMPSON, B. S., B. S. A., *Instructor in Agriculture, Waterford, Pa., High School.*

It is the purpose of this article to treat, in a general manner, some of the very interesting properties of the soil and to show their relation to crop production. In the first place, let us consider of what the soil is composed, and then inquire into the agencies which are instrumental in its formation.

If a handful of earth be examined microscopically, it is found to consist of small grains of sand (rock material) and bits of decayed vegetable matter, sometimes in such a state of decomposition that the original form is lost, while in other cases the form is still intact. At other times our handful of earth may not show any distinct sand grains, but is a black, finely pulverent mass known in most cases as humus. If, however, a small portion of it be placed between the teeth, we are soon convinced of its gritty nature.

The microscope tells us more of the soil's true composition; even with a simple lens, it is seen to be made up of pieces of grit or sand of varying sizes, mixed with organic matter. The compound microscope shows these sand grains to be fragments of quartz, bits of feldspar, shreds of mica, or some other mineral substance. Often, however, these minerals are in such an advanced state of decomposition that their distinct mineral character are lost.

Granting that the soil is a mixture of various mineral particles and organic matter, let us consider the causes of its formation. In nature nothing is at rest. Agencies are everywhere active, tearing down and building up, changing materials from one form to another. These changes are of two kinds, chemical and physical. The forces may act singly or together, but in all this process of change, nothing is lost. The conservation of matter is complete.

Finding our soil made up of mineral particles, we naturally look to the rocks as the source of these materials. That the solid rocks are broken up by Nature's agents may readily be observed. The rending action of frost on a quarry face is a familiar example. These agents of disintegration will be considered later. A rock, as we know it, is made up of an aggregate of minerals. A mineral is a substance in nature having a definite chemical compound. That a rock is composed of minerals may readily be seen by examining a hard specimen of granite. With the naked eye one is enabled to distinguish particles of the minerals, quartz, feldspar, mica, and sometimes, hornblende. If a thin section of this same granite be examined under a microscope, the mineral character is more pronounced. In addition to the minerals named above, we may find small crystals of apatite, etc., or other such minerals. Therefore, since the soil particles examined were made up of similar minerals, we naturally conclude that they were derived from the rocks. The process of soil formation may be considered under the head of rock weathering. Many and varied are the agents which contribute their share to the process. The action of the forces at work may cause

either disintegration or decomposition. In the first case the rock mass is simply broken into finer portions, the minerals of which it is composed remaining intact, while in the case of decomposition, the mineral form is changed. Decomposition proceeds more readily as disintegration advances, on account of there being more surface exposed.

The agents which cause weathering are (1) the atmosphere, (2) water, and (3) plants and animals. In the atmosphere are certain gases, which act chemically upon rock substances and cause them to become decomposed. The expansion caused by heat and cold, often causes a mechanical rending of rock particles. Wind, especially when laden with dust and fine sand particles, acts as an abrasive agent which is responsible for the wearing away of much rock surface.

Water contains many substances which act chemically upon rock substances. Most rocks are not soluble in pure water, but let carbon-dioxide or some such substance be present, and its action is very marked. Water, again, has a great erosive power, and by this action aids materially in weathering. Water, as ice, has a great crushing power, aside from its transporting quality. The mechanical action of tree roots is familiar to all. Earth worms and allied animals in the soil serve to disintegrate the soil particles. Bacteria, also found in the soil, serve a similar purpose.

The above forces, sometimes one and sometimes another, serve to rend and decompose even the hardest rocks. Some varieties are much more easily weathered than others, but when the time element is considered, we see that the resulting material is, indeed, of great abundance. To this material, which is spread as a blanket over the earth, we give the name, soil.

A soil composed wholly of rock fragments, however, is not all that is necessary from an agricultural standpoint. Some organic matter must be present. This is furnished by decaying portions of plant and animal matter. The organic matter helps to make available portions of the soil constituents needed as plant food. The amount of organic matter in any soil depends upon many factors among which may be mentioned its method of formation, climatic conditions, previous treatment, etc.

PROPERTIES OF THE SOIL.

Let us now consider a few of the properties of the soil and show their relation to crop production. One substance that must be present to make a soil available for cropping, is water. Without moisture, no matter how rich the soil may be, we can have no production. A plant derives its food by the action of water, which carries it in solution to all parts of the plant body. The small root hairs penetrating the intra-spaces of the soil must find water. Water in the soil is held in three forms, hygroscopic, capillary and gravitational. Hygroscopic water is held as a thin film about the soil particles, capillary water is that contained in the small tube-like openings made by the intra-soil spaces. Gravitational water is that which will drain away from the soil, due to the force of gravity. It is from the capillary water that the root hairs secure the moisture. By the laws of capillary attraction, the smaller the tubes the higher

the liquid will rise. The amount of water then that a soil will hold depends, primarily, on the size of the soil particles. The amount of organic matter present in any soil materially effects its water-holding capacity. The more humus present, the more water held. The humus content, however, may be so excessive that too great a supply of water is held, as in the case of peaty soils.

In this matter of moisture, we seek for a medium amount, too much or too little being detrimental. When gravitational water fills all of the pore space, we have no room for the much needed oxygen, a point that will be considered later.

The temperature of a soil naturally effects the growth of crops. It is well known that certain temperatures are required for germination. There is a maximum and a minimum temperature between which all plant life must be kept, in order to secure growth. These temperatures range from 41 degrees to 115 degrees F., with the best average growth at about 85 degrees F. If, therefore, the farmer is able to help nature keep an average soil temperature, he has very materially aided in crop production. A wet soil is naturally a cool soil. If too much drainage water be present, we may increase the temperature by land drainage. Farm manure and other decaying organic matter, by the action of fermentation, sets up a heating effect which is instrumental in warming the soil. Farm manure, therefore, has a secondary effect other than that of a fertilizer. It is found also that tillage helps to warm the soil, allowing the warm air to circulate among the soil particles. This, then, is another factor that may be aided by the farmer.

Plant roots must secure oxygen or the plant cannot live. The oxygen is supplied by the air in the soil. A soil that is so packed that but little pore space remains, or whose pore space is filled with drainage water, cannot possibly be productive. The first condition may be benefited by tillage, by a loosing up of the soil particles, so that air may enter. The second is helped by draining, removing the surplus water, thereby allowing aeration to proceed.

The question of tillage is probably one of the most important factors that farmers have to deal with. As we have seen, tillage is useful in controlling the moisture, the temperature and the circulation of air in the soil. Working over the surface layers forms a mulch which breaks up the capillary spaces, thereby conserving the moisture. By stirring the soil we increase the pore space near the surface, thus making the passage of the air more pronounced, increasing thereby the soil temperature and supplying the vital element, oxygen.

The question of soil fertility is indeed an important one and is well worthy of our consideration. Of the ten elements used by the plant as food, but three, with possibly a fourth, are liable to exhaustion. These are nitrogen, phosphorus, potassium and lime. The question of soil fertility from a chemical point of view resolves itself into the supplying of these elements to the soil. We must not lose sight of the physical properties, for by their action the availability of our fertility constituents is largely controlled. Crops, when removed from the land carry varying amounts of plant food. One hundred bushels of corn for example contains 100 pounds of nitrogen, 17 pounds of phosphorus, and 19 pounds of potassium. Seventy-five bushels of oats contains 45 pounds of nitrogen, 7 pounds of

phosphorus and 9 pounds of potassium, while 3 tons of clover has 120 pounds of nitrogen, 15 pounds of phosphorus, and 90 pounds of potassium. Thus, it is seen that different crops remove different amounts of fertility. By a chemical analysis one may find the amount of these constituents in a soil, but to find their availability is a different question. If, however, we find a soil lacking in one or more of these elements we may reasonably expect to benefit it by supplying some substance containing the lacking element.

Here the subject of fertilizers comes in. These may be supplied as commercial mixtures or as home grown material. Farm manure, lime, ground bone, phosphate rock and potassium chloride are natural products and may be used to correct any deficiency in a soil. The farm manure supplies some of all of the essential elements, besides forming humus, which so materially aids in making the plant food available. Lime corrects any acidity that may be present. Ground bone or phosphate rock supplies phosphorus, and potassium chlorid, potassium. These substances by the action of humus and nitrifying bacteria soon become available as plant food. Commercial fertilizers contain these substances in a soluble form, thus making them more readily available, and also more liable to loss.

We have one species of plants, those belonging to the order Leguminosae, which act as hosts to a species of bacteria which gather the nitrogen from the air and renders it available as plant food. No other plants behave thus towards nitrogen. This makes the clovers, alfalfa, soy beans, cow-peas, etc., especially valuable in crop rotation. We have seen that different plants absorb different amounts of the elements of plant food. Therefore, the farmer by a judicious selection of crops is able to economize in plant food. It is, therefore, potent that in any consideration of crop production many points are to be considered. We have seen that the farmer is often able to aid nature. In any rational system of farming two main points should be kept in mind: (1) To get the most profit out of the soil, and (2) to leave it in the best possible condition. To leave it in the best possible condition one must take into consideration all sides of the question. The best soil will be one in which all of the essential elements of fertility are present, and in an available condition as plant food, and one in which the physical properties are of the best. Tillage should be excellent, humus and bacteria should be there to perform their important function, and careful and consistent cropping should be practical, the climatic conditions regarding rainfall, humidity and temperature should be ideal. In a soil with such conditions we may expect a good crop, and good in every sense of the word. Thus we see that farming is quite a business after all, and that the best farmer should be a laborer, a nature student and, we may add, a good, practical business man.

SUCCESS.

By E. A. HERSHBERGER, *Cessna, Pa.*

If there is one thing more than another which fills the thought of every young man and woman in the land, it is the desire to make a success in life. No one is worthy the name of man or woman who has not enough ambition to try to make a success of life.

What constitutes true success? Let us mention a few things that are necessary and essential to success: First. We should not be neglectful of the comforts and happiness of those about us. Life is not a real success which finds its motive power in the thought, that money-getting is the great object in life. A man may accumulate the wealth of a Vanderbilt or an Astor and yet his life be a complete failure so far as the nobler life within him is concerned. It is not how big the bank account is or how big the vault which carries our earthly treasures, that attest the victory of living. No, it is not this that has been your thought in accumulating money.

Has it been that you might be of some service to your fellow-man? That you might help and relieve those about you less fortunate than yourself? If your only motive has been to minister to your own selfish comfort and luxury, in the heaping up of gold, then your life, I say, is a miserable failure. Are you living with the one thought of how you can serve your selfish ambition and rise to places of influence simply to gratify a selfish need of power?

Surely such a life none, judging by right standards, will name as impelled, by proper motives, neither can it be called in any sense successful. Understand I am not begrudging any one the wealth which they may possess, because I do not possess any myself. I do not belittle the power of money or the ambition in gaining it, or the influence that culture and intellectual power bring with it, but I do say it is a shame to figure from such accumulation of riches or power alone an answer of success.

That life is a real success which blesses as it goes, which, while it enriches self, enriches others which, while it accumulates power, lifts others with it.

Second. Another element of success is economy. By this we mean the management, regulation or supervision of means or resources, especially the management of the home, the farm and the concerns of a household; hence, a frugal and judicious use of money, material and time, the avoidance of waste or extravagance in the management or use of anything, frugality in the expenditures of money and material.

In the care of important matters, public and private, the largest safety is to be assured by reposing confidence in those who have faithfully and habitually enforced for themselves the policy of wise economy. Observe the examples of Washington and Jefferson. Reading their papers it will be seen with what scrupulous care they administered their households. Washington, in camp with the cares

of the campaign devolved upon him, looked after the expenditures of himself and those of the army. This same policy of economy was carried out while he was President of the United States. Jefferson planned his home and his farm and everything to the last detail; all this to avoid waste, to enforce reasonable economy. He exercised the same economical principles during his administration as President and in fact during the whole of his public and useful life. Such men are to be trusted. They were the highest types of the class of men in whom others put confidence. Some one has said: "Never trust a man to save for you who does not save for himself."

Another element that should not be forgotten at this time and that is industry. We know that the sturdy men and women of the early days in our own country were workers, honest, frugal and saving. They worked hard in clearing and cultivating the land, and in founding settlements, and the same rule holds good at the present time. If we wish to accomplish anything we must work. The immortal Lincoln once said: "You can't get something for nothing. Labor must earn, economy must rule, frugality must save." It should be impressed upon the minds of the young and be heeded as a truthful maxim by all, that money represents toil. Labor is the producing power.

I wish to mention one other element of vital importance to success, and that is education, and this is particularly applicable to the younger people of to-day, whether you are or intend to be farmer, mechanic, business man or professional man, get the best education opportunity may offer and diligent study secure. Someone has said, we can not all be college'men. True, we all can not, but with the school advantages we have to-day, our good buildings, our free text-book system, and with our wise and able supervision we should at least be able to get a good practical school education. Conquer the rudiments, learn to spell well, to write intelligently, learn grammar, the rules and logic of your language, study arithmetic and apply it for practical and business equipment. Keep your accounts with careful accuracy, shun bad company, work to become self-sustaining and independent. Take a proper and cool-minded interest in public affairs. Read good books and read to learn and remember.

I will close by using a quotation of Henry W. Curtis:

"Little words of sympathy, little acts of kindness, little deeds of love, little helping hands encircling others and making easier the way for them, these are the little successes which, when gathered into one great whole, give the pattern of life which God approves."

THE MISSION OF BIRDS.

By IVY M. BREED, *Breedtown, Pa.*

Birds are one of the most beautiful of God's creations. What is prettier than the busy little humming-birds which flit from flower to flower, sipping their nectar, or our red-breasted robin whom we greet with joy because he is, as we say, "The harbinger of spring."

We read in the Bible that Noah sent forth a dove from the ark to ascertain whether or not there was dry land. It was sent forth three times. The second time it returned with an olive leaf, and the third time it did not return at all. By this, Noah knew that, not only was there dry land, but also something upon which the dove could live. What greater work could a bird have than to be man's helper in finding him a place to live?

The raven, although it is not a handsome bird nor even a sweet singer, also had a mission to fulfill, for, when, on account of a famine, Elijah had nothing upon which to live, it was an instrument in God's hands to bring him food.

When the Gauls had conquered all of Rome, but a hill upon which stood its guardian gods—Jupiter, Juno and Minerva—if it had not been for the sacred geese of Juno this hill would have been captured; but the geese hearing the Gauls ascending the hill began to cackle and their cackling awakened the guards who spread the alarm, and, when the Romans attacked the Gauls they easily conquered them. Thus Rome, as we might say, was saved by geese.

The parrot can be taught to talk almost as plainly as a person. During the absence of a family who owned one of these talkative parrots, robbers entered the house, gathered up all the valuables they could find and put them in a parcel for carrying away. The package was made up and they were just about starting off with it, when suddenly a loud voice rang through the room to their ears: "I see you! I see you! John, bring my gun quick!" The robbers were so frightened that leaving their bundle they hastened to the window and jumped out into a neighboring yard, where escape was impossible, and so were captured and brought to justice.

But this is just a few of the more remarkable facts of the mission of birds. They are nearly all useful in some way. Many of our birds live upon insects which would destroy a large amount of our fruits and vegetables. It is said that a brood of birds which consists on an average of five, will destroy in about thirty days nearly 7,500 flies or other insects. Each fly eats daily in flowers, leaves and buds a quantity equal to its weight until it has obtained its growth. In thirty days it will have eaten one flower a day, a flower which would have produced a specimen of fruit. Thus in thirty days, each fly having eaten fruits, the 7,500 flies which a brood of birds would have destroyed causes us to lose 225,000 apples, peaches, pears and other fruits. This is a strong argument in favor of the preservation of birds, a measure alike to the advantage of the producer and consumer.

Would not this earth be desolate indeed if it were not for the songs of birds? How many a hard-working man or woman is encouraged in their toil by the songsters around them? And how many a sick person who has spent all his life in some large city where he has never heard the songs of birds, unless it might be that of some caged captive, whose melody is not so thrilling by half as from one that is flying from tree to tree and pouring forth its soul in music to its Almighty Creator, is brought back to health and given a new determination to live a better life by going for a while into the country where he can hear the songs of birds?

If, therefore, birds play such an important part for the world's good, let us try to make their lives as happy as possible by not

decorating our hats and homes with their dead bodies, and by so doing causing the immense slaughter of those harmless creatures for these purposes to cease.

STRAWBERRY CULTURE.

By MYRTA FRANTZ, *Miller's Station.*

It is true that the success in growing strawberries depends greatly upon the knowledge of the farmer or, in other words, fruit must be known, its requirements in regard to both locality and soil. In starting with the perfect plant, and as it regenerates, it becomes more unlike the first or perfect plant. Therefore, in setting a bed it is always best to take the plants from the centre of the row. It has even been known when beds have been set from runners for year after year, to go back so far as to appear in a form resembling the dewberry or in a cranberry.

In preparing for setting, the soil should be very mellow and quite rich. If it is necessary to add fertilizer it should be plowed under, or if used as a top-dressing, it should be well harrowed into the soil. No fertilizer of any kind should be put directly on the plant.

In setting, the rows should be about four feet apart, and the plants in the row about eighteen inches apart. The roots of the plant should be separated and placed in the mellow soil at full length, bringing the dirt around the plant (leaving the crown above the level of the ground,) great care should be taken that the crown is not covered, for if it be, it will cause it to decay, therefore the plant will die.

The strawberry must have the attention that other plants should have. Take the corn plant, for instance, should be studied and assisted in its growth, but will allow and very often gets haphazard cultivation, and yet produces somewhere near the crop desired. The strawberry on the contrary will amount to nothing with such cultivation.

Perhaps many of us have heard the illustration drawn between the first and second fiddler. The first fiddler is the high priced fellow, you know. He has won a reputation for furnishing fine music and will not, or need not play for less than \$25 per night, and often very much more than this. He uses only the very best instrument that can be obtained, and it is he who takes pride in his occupation and his life is crowned with success. While the second fiddler generally plays for his supper (and that often at the second table) he uses some old worn out instrument which has been discarded by the first for years and years and his life throughout is traced by failure. I think these same rules (if we may call them such) may be applied to the strawberry grower (and others) for the fact is there are too many "second fiddlers."

Now, as for the perfect and imperfect blossom. It is our experience in the past twelve years that the perfect blossoming plant is grown here or in this locality with greater success, while the imperfect, if set among those of the perfect and if assisted by the agents of pollenization, which are bees, insects, etc., and thus bear fruit, it is generally of a very fine quality. But supposing, for instance, there should come a splashing rain when they were in full bloom the pollen would be driven to the ground and in damp weather bees and insects can not work; therefore, there will be no fruit, while with the perfect blossom a crop is almost a sure thing.

The question is often asked, Which is the better, the matted row or those planted in the hill? and can be answered in this way, when planted in the hill, the berry perhaps will be larger, or in other words, "hill culture may be defined as a method of consolidating many small plants into one very large plant and many small berries into one very large berry." But one growing them for the profit, can not afford the use of so much soil as one can raise from three to five times the number of bushels from the matted row as can be raised when set in the hill.

When set in the spring (and they should be set at no other time) they should be cultivated in less than one week after setting, and weekly cultivations continued throughout the summer. The blossoms should also be picked off the first season after setting as the plant has not the strength to produce fruit and also runners.

In the fall after the ground is frozen they should be mulched with a light covering of straw or leaves and some use corn fodder. This is to protect the plant, not from freezing, for it is not the freezing that injures it, but it is when the ground has been frozen for a few days and then the sun shines hot the ground will thaw, contract and heave up, often breaking the tender roots. But if they are shaded by a light covering they will not thaw on these warm days but remain frozen and when a long warm spell does come, the frost will dissolve on the underside of this frozen part first, therefore the plant cannot be injured.

In the spring before the weather gets very warm, lift the mulch from the plant and if they be on very sandy ground it is well to place it in path and under foliage as it will protect the berries from sanding and we all know sanded berries are not very salable. This being done there should be no further work in the bed until harvesting. I guess we all know how to pick berries so it is needless to dwell here.

When through bearing, the plant is utterly exhausted and something must be done at once to assist them in recovery. The old leaves are no longer of use, and should be burned over whenever possible in order to kill the spores of fungi, rust and insects, which might have found lodgment. Mow the tops off and stir up the mulch if it is quite thick, rake off all except just enough to cause the fire to run over the ground; only a little is needed to do this.

But the burning must be done immediately after picking season is over. It must not be burned after the new growth is started. A strong wind must prevail to drive the fire over the ground rapidly when there will be no danger of heating the crowns, and they must be cultivated the same day after burning. While some extensive growers a new bed each year is preferred.

IS IT A LASTING BENEFIT FOR WOMEN TO HELP WITH OUTDOOR WORK?

By MRS. JENNIE R. ROHN, *Easton, Pa.*

The idea of outdoor work connected with this subject, will be considered as meaning work on the fields and around the barn, such work as falls within the line of men's work. A short consideration will suffice to show that this is not woman's place of regular duty. There may be certain conditions under which it is allowable for women to do outdoor work, but then it must be such work as is specially fit for them.

There are more than material benefits which must be considered in this world. Often what seems to pay for the time being does not in the long run. There are women who work in the fields with their husbands, doing any kind of work for the only reason that thus they might save that much expense which would be required to pay another hand. Now women are not physically created to do that sort of labor. The result is that what is saved there, will be required to restore the ruined health of those women. The housewife certainly should not be confined continually in her kitchen, but should find time to take advantage of the healthful influence of outdoor air; and yet it becomes a serious question whether she shall breathe that air as a laborer upon the field. Woman is to be the helpmeet of man, but not in that sense. Her sphere is the home, and she is eminently fitted for her sphere. She was thus intended by the Divine Maker. Although in this age of ours the 'new woman' is making herself prominent, and wants to take men's place, yet I hold that it would be far better for the coming generations if she would keep her place, where she is needed and for which she is adapted, namely, the home.

The house, the yard and the garden constitute the home. This is the kingdom over which she should be queen. Woman's nature, you know, is peculiarly inclined toward the beautiful and the good. I hope the men will excuse me for praising those of my own sex so highly, but those of you who are husbands will agree with me when you consider what good taste your wives displayed in choosing you as their husbands. Women love the beautiful, you see; of course this is not saying that the men do not. But it is woman's duty to make the home beautiful and tastefully arrange things, and keep everything neat and tidy. The men should not be greeted by slovenly housewives at the threshold, when they return from the fields. Men, too, have some sense of what is tasteful and artistic, and delight to see their homes orderly and cleanly. Where the family is large, much attention is required of the mother. The children must be looked after and cared for and trained; besides the husband must not find a button off his pair of newly washed trousers, nor a hole unpatched in his blouse. She must see that toothsome meals are ready, and that the larder is well supplied. Her flower plants must be looked after and her gardens kept clean.

Such are the necessary conditions to peace and true family harmony. Is this not sufficient work for the housewife? Is she not doing her duty as helpmeet in the truest sense? Does not society owe her a debt of gratitude? Has it not been truly said, "The hand that rocks the cradle rules the world." When a child suffers, where does it go for sympathy? When sickness visits the family, whose care is most sought? Women's mission is to minister to the wants of the household, whilst men's is to supply its needs. Now from the fact that woman is the weaker vessel, with a more tender nature, it is plain that her duties are of a lighter and tender character, such as requires less strength.

Most of the work of the field requires the strength of men. It is such work as hardens the muscles, and causes the body to grow lusty and robust. It is, however, work which benumbs the tender nature of the woman, and makes her masculine in her manners. As acknowledged before, there are conditions and circumstances under which it may be beneficial for women to work out of doors. In harvest time where there are a number of women in the family and are not all needed it is allowable for them to go out upon the field and lend a hand in reaping the golden grain or help disposing of the new mown hay. They may also help husk the maize. But in all such work a woman should not be required to exert herself unduly and at the expense of her own household duties. The enjoyment of doing a thing on the field, or in the barn, pertaining to men's work, should determine whether it be fit for women, and, therefore, beneficial. Women should not undertake outdoor work that is tedious and wearisome, and overtaxes the tender nervous system of a woman. But, on the whole, I do not believe that women have any business to do work of that sort. In case of emergency it is all right, when there is no other way. As the ignorant remark that was made, that my husband could not even change a shaft without my assistance. No housewife that is faithful and dutiful, will refuse to do what she conveniently can, around the barn and on particular occasions on the fields, as a "a lift" to the husband's burdens, provided that work is reasonably within her sphere. For a fact, I think, that where the women attend to the cultivation which their yards and gardens require, they will experience enough of change from the daily routine, and will find, in addition to their countless little trips to and from the house, sufficient exposure to the open air and plenty of outdoor work. Where a young couple start out farm life together, there are often great plans made and high hopes entertained, and for the purpose of getting wealth they work faithfully and almost alone, early and late.

There may be a temporal benefit, as far as the economic side of it is concerned, but it can never hold out. I believe that many of our farming people, and others for that matter, could enjoy life better if they would only do what lay within their means. Hundreds are old before their time. Rheumatic and crippled at and before fifty so that old age is nothing but suffering and the fruits of their toil can not be properly enjoyed. All violations of the laws of health, we are told, bring their penalties.

Where then, does the benefit come in, at last, if women, whatever the motives or reasons may be, work out upon the fields and in the capacities of a farm-hand, as is so often seen, where does the benefit

come in, finally even if there are a few hundred dollars more made, if health is impaired and enjoyment of life ever thereafter an impossibility? Such is the unavoidable result of any foolish idea to put woman out of her sphere, and place her where she is not intended. I can see no lasting benefit in having women do outdoor work.

THE TRUE HEROINE.

By MISS MAE L. HARTER. *Millerstown, Pa.*

There is probably no word in the English language which carries with it a greater sense of pride than the word heroine, and especially so to our own sex. The utterance of this word at once suggests to us the idea of perseverance, bravery, greatness, nobleness and fame. We do not recognize the influence that the word heroism has over us, but in truth it means a great deal. When we read the paper we pass over much of the contents in a disinterested way, but should our eyes fall upon the heading "A True Heroine," how suddenly we stop and are soon interested in the contents of the paper. In ages past all history, all nations, all classes of society have had their heroines. Heroes! Yes, there are many heroes, and I sometimes think we forget that these are not only men whose names are worthy to be recorded, but there are women, heroines of whom we are proud to-day.

As we look back over the ages of the past, whose heart does not thrill with pride when they read of Mollie Pitcher and her heroic act, of Florence Nightingale and her life of sacrifice! And who does not remember the brave Grace Darling? Not only these but the more modern heroines as Clara Barton and the nurses who served in the recent war with Spain. These brave women stand in history as heroines, and their names shall not be forgotten. Although we would be loyal to those whose brave deeds are recorded in history we would be animated to greater work by the examples they have given us. Yet we would not convey the impressions that these, who have done some public act, or have come in touch with the masses only are heroines.

And now the question arises, What does heroism mean? What is it to be a true heroine? And it is here we would have you think for yourselves. Does it consist in fame, in praise, in the doing of some great act alone? If so, I fear that many of us would not be heroines.

We see a mother weary of the many cares that she has, the little ones crying for bread, the landlord demanding his rent, the chilling blasts of winter telling that fuel must be required or starvation and death are sure. The poet must have thought something of this when he wrote:

"With fingers weary and worn, and eyelids heavy and sad,
A woman sat in womanly rags plying her needle and thread;
Stitch, stitch, stitch, in poverty, hunger and dirt,
And that with a voice of dolorous pitch,
(Would that its tones could reach the rich,)
She sang the song of the shirt."

Was she not a heroine?

Many a young woman to-day is sacrificing friends, the pleasures of home and society in order to secure an education which will prepare her for a noble, useful life. Is she a heroine? The factory girl is arranging the fabrics to be woven into cloth, day after day she stands, her strength almost failing her sometimes, but she remembers her aged mother at home or the sister who needs her earnings, and maybe she is desirous for an education, no matter how great her ambition may be, she will sacrifice them all for the sake of home. I ask you is she a heroine?

And now what of the merry farmer girls? Every day we meet these jolly girls, whose cheerful faces and peals of laughter make you feel as if there were no sadness in the world, and only one side of life, and that the sunny side. But, look closer, do you not see behind those long lashes a tear? Back of those kind words do you not feel there is, perhaps, a heavy heart or a weary sigh, longing to obtain a higher, but not nobler sphere? Can you note the sacrifice it takes for that young life to be happy? There are true hearts and nobler lives all about us, we meet them every day and because we do not see the struggles in that life, because we do not know the many hours of pain and conflict between the right and wrong hidden behind the reflecting light of smiles, does this mean that the life is not worthy of praise? Oh! no. She is a heroine. A true heroine who has made and is even making sacrifice for others, so that other lives may be better and happier. And these are the heroines of which we know little. And only in the last day when He who understands the motives and thoughts of every life shall lift the veil and reveal the mysteries, only then will we see and know that the lives of many of those about us whom we thought insignificant, shall stand forth in beauty, bearing the banner, "A True Heroine."

TO BE A CITIZEN.

By **ETTA FRESHKORN**, *Ellwood, City, Pa.*

Our relation, as individuals, to the country in which we reside is very apparent. At an early date in the world's history this relation was treated in a narrower sense, than it is at the present time, but it had practically the same meaning. Different words were used by many of the ancient nations, to express this intimacy between individuals and state; but the French nation has the honor of supplying the universal term "citizenship."

Citizenship is the word which, to-day, expresses this relation throughout the civilized world, yet it does not have the same meaning in every nation. Since citizenship does not have the same meaning in every nation, we naturally ask: What constitutes the basis of citizenship? Or, what does it mean to be a citizen?

We cannot better convey the meaning of this ideal, than by

quoting a portion of the oath which young men took in Athens, when they arrived at man's estate. "I will do battle," they swore "for our own altars and our homes, whether aided or unaided. I will leave our country not less, but greater than she is intrusted to me. I will reverently obey the citizens, who shall act as judges. I will obey the laws which have been ordained, and which in time to come shall be ordained, by the national will." This is the spirit which pervaded civic life 2,000 years ago, and in such a spirit is found the true meaning of citizenship.

Aristotle defined a citizen as one who participates in the legislative and judicial authority of the state; but he left the people in utter darkness as to what was meant by a state. This is, in a strict sense, not only indefinite, but untrue. It was during the time of the Roman Republic that citizenship belonged only to those who were inhabitants of a city and the citizen of one town were not citizens of another town in the same county. These narrow political and social sympathies of the ancients, prevented them from ever uniting to form a single nation; thus the city was regarded as a distinct self-governing state. A state may be regarded at the present time, as the whole body of people united under one government, whether they participate in the government or not. The city has, to some extent, lost its supremacy, and now is regarded as part of the state. Hence what could be said of a state in the time of Aristotle, could not be said of a state now.

The true foundation of government is found in the fact, that every person has natural rights, which every other person is bound to respect. As civilization advances these rights become more numerous. It is not until a nation becomes highly enough civilized to recognize these rights, that it institutes a government to protect them. The number of rights of any people will be in proportion to their wills, desires and ideas. We can, therefore, attribute our higher and more complex forms of government to the advance in civilization.

It then becomes self-evident that citizenship will mean most under the highest form of government, a right which is the most important possession an individual can have. For the protection of these rights, men have sacrificed their lives, pleasures, homes and stained many a battlefield with their blood. In such actions is found the true spirit of the citizen and on such actions depend the strength of government. True it is, that American citizenship means more to us, than any other citizenship; not only because it lives and flourishes beneath the freest and best institutions of the world, but because it has the perpetuity and success of these institutions absolutely in its own keeping and control.

In order that the duty and responsibility we owe to our government, may be fully appreciated and faithfully discharged, it is vitally necessary for us to be convinced, that we cannot delegate to others the work required of us. Each individual must, with his own hands, do his share. In this way was our government formed; and in this way only, can it be kept in proper condition for the habitation of free Americans. It, therefore, follows that no one can lay claim, in a proper sense, to true American citizenship, who does not interest himself in matters pertaining to our own government, who does not inform himself as to its designs and purposes,

or who is not willing to guard it against abuse and insidious perversion, as well as against open attack.

If you would be a famous actor in the drama of life, you must act your part well. But, however, we must say, that unless a person participates in public affairs in the proper spirit, he is not brought into any closer union with the government; for no one increases his claim to citizenship, who interests himself in public matters for purely selfish motives, or to gain personal ends. The person who would rise to the highest degree of citizenship, must be interested in humanity. He must not only look after his own interests, but he must respect the interests of the masses of people.

The existence of the highest type of citizenship depends largely upon the cultivation of the best and most patriotic sentiments of our people. It is, however, true that it depends to an equal, if not greater degree, upon the constant steadiness of sound American judgment and the ability among our citizens to resist temptation. Perhaps no nation as young as the American nation has been confronted by so many temptations. It has also been presented with many opportunities, to enter upon a course of new and strange adventure. But a few years hence temptation whispered alluring words of conquest and expansion in our ears and pointed out to us the fields bright with the glories of war. Our engagement with Spain presented a favorable opportunity for our own people to exhibit their true worth as citizens. So intense was the love for the rights of others, that even without the call of the President, thousands of men offered themselves in defense of these rights.

As every particle of matter in the universe has an attraction for every other particle, so has every individual rights which every other individual is bound to respect. It was on this principle that the Americans acted, and for this reason was the "White Squadron" sent to the Spanish ports, to protect the rights of the Cubans. Such actions as these belong only to true patriotic citizens.

We have as yet treated citizenship as belonging only to those, who take part in government affairs; but in every state there are two classes of citizens; those which are permitted to participate in the government and those which are denied of this privilege. It is, therefore, implied that citizenship cannot mean the same to every person; yet patriotism, which is the underlying principle of citizenship, makes it possible for every one to attain it to some degree of identity.

If patriotism is exhibited by the man, who leaves home and friends, to follow our flag in war, it is none the less exhibited by the wife or mother who remains at home to weep and mourn. If it animates the leader of soldiers on the field, it no less animates those who prepare men for the faithful discharge of their duties in times of peace.

Grand and noble as it is to be a Washington or a Lincoln, to no less degree is it grand to be a Willard or a Barton.

From these reasons we infer that citizenship does not only belong to those whose names have become famous in history and governmental affairs; but also to those whose privileges are restricted by the government, and to those whose lives are devoted to the welfare of mankind. It should be the earnest desire of every one to become a true loyal citizen. Not because every citizen is held in the highest

respect, by his fellow-citizen, not for the mere name of being a citizen, but because he owes it as a duty to his government. The height of any government is measured by its citizens.

The "Chicago Riots," the "Great Strikes" and the "Whiskey Rebellion" were all overcome by true patriotic citizens. Our country has been visited by many other calamities equally as disastrous. In the time of the great "National distress" the Ship of State was caused to rock to and fro, but with a man, of true citizenship, at the helm, it was guided safely into the harbor.

We feel constrained to speak on other traits of citizenship, but we will not enter into any deeper discussion of this subject. Much must be left unsaid about this valuable possession. Its real worth cannot be estimated.

The astronomer says, "Give us matter and a little motion and we will construct the universe;" but we say, give us true citizens, inspired with patriotism and we will rule the universe. The world is ruled by its citizens and it is they that think:

"Life is real; life is earnest
And the grave is not its goal."

FARMING AND FRUIT GROWING IN THE SOUTH.

By MRS. J. L. PITZER, *Carnegie, Pa.*

Knowing as I do the close study that the Pennsylvania farmers make of their business, and the fine intelligence they bring to bear on the minutest detail that could be made to serve to their advantage, it would be hopeless for me to try to suggest anything that would be of interest to you in your studied field.

Fifteen years residence in the South, and five years of that time in a farming and fruit growing section, gave me a knowledge of how the "cracker" farmer works that might be of some interest.

The "cracker" farmer, to begin with, and especially in Florida, has a soil to work that is sandy and in the high rolling pine lands, lacking humus. In the hummock lands or land that has had hard wood deciduous trees, the humus part will be better. Some of the hummock land and the reclaimed or drained lands are very rich and productive but are liable to be somewhat malarious and infested with mosquitoes, but the rolling pine lands are entirely free from both. The hummock lands, with the aid of such fertilizers as the farmer can provide from composts, etc., are good for steady cultivation, but it is in the pine lands where he needs to get his thinking cap on. Humus must be secured and commercial fertilizer must be restored to. And the northern farmer in the South will do well to follow the instructions of the "cracker" farmer, though he may think that he has forgotten more than the "cracker" ever knew, he will do well to heed his counsel and save his dollars as experimenting with commercial fertilizers is an expensive pastime that many a northerner can testify to.

Their crops are queer in some respects. Their sugar-cane has to be propagated by planting the cane as it makes no seed. The canes are laid in the furrows and then cut into short sections and covered over with the plow. The grinding and syrup-making are the jolliest events of the year.

Their sweet potatoes they plant the vines. Long ridges are thrown up and the vines (that have been produced in special beds) are dropped along and poked down with a pronged stick. If you order potatoes sent from the store they will send you sweet potatoes, unless you specify Irish. Their oats are a red variety from Mexico. Their rye, a small hard variety, adapted to the climate. In place of our clover for feed and renovating the land, they have the various kinds of cow-peas, and a great resource they are for stock and for the table. They raise fair corn and it has to be gathered and kept with all the husks on or the weevil will eat it up. The millets and kaffir corn do well. The most valuable root crop is cassava, which yields an enormous tonnage of tubers and is excellent for cooking purposes, and cattle and horses eat greedily of and thrive on it.

In raising cotton, the seeds are strewn by hand in furrows, and when the plants are a few inches high, they are, as they call it, "chopped to a stand," that is the plants are left about two feet apart and the planting, cultivating, picking and ginning is a twelve months job.

A large amount of tobacco is raised and requires constant going over to pick off the worms that would make holes in the leaves. This work is frequently trusted to turkeys, as they can be trained to take rows in regular order and it is a smart worm that can escape their sharp eyes.

Their Bermuda grass for lawns and pasture has to be raised from cuttings, and roots of the grass, as it makes no seed in this country. They grow almost all kinds of vegetables, excepting rhubarb and horseradish, which they will not grow there. Their small fruits are limited to blackberries, blueberries, huckleberries and strawberries; the latter vines bearing from January to July. No northern fruit trees do any good in that climate. Oranges, lemons, limes, grape fruit, guavas, pineapples, bananas, figs and grapes, making about their list of fruits.

The only kind of grapes that do well (except for expert cultivation) are the three varieties of the Scuppernong. They are not subject to mildew and they grow three to four in a bunch and are gathered like plums. The vines are trained on a flat trellis and one vine can cover an acre or more. Oranges are many named and distinct varieties, kept true by using buds. The rusty orange is not a distinct variety, but in some of the pine land groves, a small insect prevails that punctures the skin and the oil drying on the surface gives the rusty appearance to the fruit. The hummock fruit is always bright. Lemons are of various varieties and are cut when two inches in diameter and still green and are made yellow by sulphur smoke. Each orange and lemon has to be clipped off with a pair of shears as they cannot be pulled or shaken without tearing the skin. Pineapples are propagated from the spines from the apple and from root suckers, as they have no seed. Bananas are also propagated from suckers as they have no seed. Figs are raised

from cuttings and are the only tree that produces fruit without a bloom. They have no flower of any kind.

The watermelon reaches the pink of perfection there and the "darkies" get as fat and sleek as polished ebony while they last. In the extreme South, alligator and avocado pears, mangoes, custard and maunee apples, sapodillas and sour saps are experimented with, mostly as curiosities, as they are properly tropical fruits.

The cattle live on the commons the year round. If you go to buy a cow for family use, the first thing you ask is, Will she eat? An animal that has come to be four or five years old and has never been fed grain or eaten out of a box, it is difficult to train them to eat that way or to eat grain at all. Their horses are small and hardy and used to the kind of grazing. If you turn a northern-raised horse out to graze, he will pull up many tufts of grass from the loose soil and will eat sand and all and will soon become "sanded" and die. A Florida pony drops these pulled up tufts and looks further.

But their hogs are the greatest curiosity of all. They are called razor-backs and are long-nosed, long-legged, slim-bodied and can outrun anything on four feet. They run wild until a few weeks before killing time, when a log pen is built out in the woods and a trail of corn is laid up to and into the pen, where they are trapped and are fed corn for a while. Their meat is excellent. They like to sleep, in moist places, at the edge of water, and this is often fatal to them, as an alligator will slip up on them and awake them. Before they can start to run a blow from his tail will send them far out into the water and piggy's days are numbered. Bears also like to eat them, but they prefer berries and tender palmetto shoots.

If the men used the same industry that you men do they ought to get along well, but they do not have to work very hard for a living and get to be rather shiftless. Their fuel is free for the gathering, their clothing bills small, and their tools cheap. Their plows are small cast-iron affairs, but are better than steel ones, for that soil. They cultivate with a sweep that you men could not keep in the ground but they can shave with one. What you would pay for a horse collar would buy several sets of their pony harness.

Taken all round, the "cracker" farmer is a happy, hospitable, honest fellow, with his beautiful lake-dotted country, with the clearest blue sky overhead, and with the balmy salt-laden breezes from the Atlantic and the Gulf, with the added fragrance of the pines keeping him away well and always hungry, his lines would indeed seem to have fallen in pleasant places.

FARM LIFE.

By MRS. ISRAEL M. KAUFFMAN, *Belleville, Pa.*

By farm life, I do not mean mere farm existence. I mean the real farm life, the spirit of push and energy that helps us to overcome all obstacles and keeps us on the farm because we love it.

Success in anything depends so much on the spirit in which we

labor. Farming is no exception. The farmer who puts thought and energy into his work will surely succeed. Conditions and circumstances are constantly changing. The methods that were all right when land was productive and help was plenty and cheap, no longer bring success. Conditions have changed. The land is not as productive as formerly; and the demand for farm help is greater than the supply. New conditions demand new methods. What shall we do? Shall we stubbornly follow the old methods, regardless of changed conditions, and thus be pushed to the wall? Or, shall we say, "Where there is a will, there is a way, and I mean to find the way." This last will require grit and determination. But it will pay in dollars and cents, and in added self-respect, enjoyment and comfort. It will put new life on the farm.

The farmer's wife should not be slow to do her part by trying to solve the perplexing questions that arise indoors. There is much talk of the overworked farmer's wife. It is true that many are overworked, but it is unjust to blame the occupation. Because it is almost impossible to secure domestic help, shall we give up in despair, and move to town? No, indeed! Not just yet, friends! Let us study the situation. Is it not possible to arrange the work on an average farm so that it shall be no more exhausting than that of our town sister with the same means? Why not make use of the laundry, the baker, and the butcher just as if we live in town? Why not have a convenient kitchen with modern improvements on the farm, as well as in town? Did some one say, "It costs too much." Oh! and are these things free in town? No, indeed, we pay for them, and pay well, or, do without. If it is impossible to do all or any of the things already mentioned, there are still other ways. For instance, must we make butter to sell? Why not reduce the work by keeping only enough cows to supply us with milk and cream? Where the farmer's wife is overworked, is it not well to consider this question?

One great objection given against farming, is the long days of labor. This is slowly being removed. Many farmers are adopting the ten-hour system. They find it pays. While we cannot adopt so exact a system in the house, we can arrange to have a little leisure during the day; and that, too, without working late at night, except, perhaps, occasionally.

Another objection given against farming, is the isolation. This, too, may be overcome. With rural free delivery and the telephone system, there is no reason why we should not be in touch with the outside world. Though we live on the farm, we may still enjoy much that is best in town life. With horses, steam and electric cars for our use, why should we not visit, shop and attend lectures in town just as if we lived there?

The farm schedule is not complete without some provision for recreation. Every family needs an occasional day off. "All work and no play makes Jack a dull boy," applies to farming as well as to any other occupation. Many of us know how much easier it is to work with an outing in view, and how much brighter life seems afterward. If it is impossible to take an extensive outing often, every farmer's wife can set aside at least one day in the week that shall be different from the other. On that day she may read a new book, write letters, or do any other pleasant thing that might other-

wise be omitted. But even in our busiest hours, let us note the beauties of nature. As often as possible let us heed the suggestion of Wm. Cullen Bryant:

"Only those who have learned to hear the still voice, can know the real charm of country life."

CULTURE ON THE FARM.

By MISS NORA J. FINCH, *Jermyn, Pa.*

In these times of busy competition, when the members of every profession are striving to reach the front rank of excellence, the farmer who will keep up to date, must be a pusher too. He must be so well read in his profession that he is able to pursue any or every line pertaining to his work with a reasonable degree of success. If his mind is given to the raising of grains and vegetables, he must know what kind of soil is best adapted to each and how much and what kind of fertilizers is necessary, how to give back to the soil the particular properties taken from it by the preceding crop, etc.

If he will be a successful grower of fruit, he must understand all the newest and best methods to be pursued along that line. If he wishes to go into dairying or the milk business and will get the best returns possible from his labors, he must understand the food and sanitary conditions that will make such a business profitable. In short, the farmer of to-day, who pretends to be a farmer is a very busy man; and so intent is he in studying how to so cultivate and improve his land as to get the best of financial results, that he sometimes forgets to look after other important duties of life.

The average farmer provides his family with good food, suitable raiment, sends his children to school a part of the year, supplies them with a weekly or perhaps a daily newspaper, and then rests content. He has done his duty. Now while this is all very good and just what he should do, yet to eat, to work, to read a little and to sleep, should not be all of life on the farm. There is a phase of life, which in the multiplicity of cares attendant on life in a farming community, is too often sadly neglected, namely, self-culture.

Culture is a great help in all the affairs of life; the lack of it a great hindrance. If a general knowledge of the usages of good society is a necessary part in the training of the city child, it is just as necessary in the training of the country child, and there is no valid reason why he should not have enough of this kind of education to enable him to pass muster when he goes out into the world to enlist for the battles of life.

But perhaps some one will ask, How is this to be brought about? How are we who live in isolated communities, shut away from the towns with all their advantages and refining influences, to this needed culture? Have you ever thought my friend, that your life

is very largely what you make it? If you are deprived of some of the advantages to be derived from a life in town, you have blessings which more than compensate you for all those losses. We believe in the old adage, "Where there's a will, there's a way."

We can think of a number of methods which may be made the means of culture, and the first and most important of all is politeness in the family. If the child is taught to be kind and courteous in the home circle, he will be the same at school, in company or wherever he may be.

Secondly, every farmer should own a good library and teach his children to read and love it. This library need not be large, but it should be well chosen; and only those books that will ennoble and elevate the mind should be found in it. In connection with this library one or two standard magazines should be taken. In these days of cheap books and papers there are very few farmers who are too poor to own such a library, and no one can estimate the far-reaching influence of good books. Set before your boys and girls high ideas of life and they will be very apt to make those ideals their own.

Thirdly. Every farming neighborhood should have at least one organization for the promotion of social culture. The more intelligent progressive members of the community should take the lead in starting such a society; then all the people in the place should rally around these leaders and give them their hearty support. When this is done, the success of the project is assured and much public good is the result.

Cities and large towns have many means of culture which would not be practical in sparsely settled districts, but we think of two societies which, if properly conducted, may be made very efficient means to this end. The first of these is the Reading Circle. By means of a systematic course of reading, such as may be taken in one of these circles, one can gain more thorough knowledge of those great minds who have made the world of literature, than could be gotten in any other way.

Another and still better aid to social culture is the old fashioned literary society. Here the country boy may get his first lessons in parliamentary rules and usages. Here he may learn to stand up in debate and speak intelligently on the different questions as they come before the society for discussion. These are very important lessons. The young man who can stand up before a society of that kind and address the house properly and gracefully, has scored a point for himself the value of which can hardly be estimated.

Perhaps some one will ask, Can such a society be made a success in the country? We answer, yes. We know of one that was sustained for three years, and only given up when so many changes had come to the neighborhood that there were not enough members left to sustain it. In this free republic of ours, the farmer need stand second to none in intelligence or culture. Education is not all book learning. A prominent educator has said, a man is educated when he is able to make the most of what there is in him. Think of this subject, ye farmers! Ye are nature's noblemen and your children are equals of any in the land. Then leave no avenue untried that will advance your mental, moral, or social worth. You

owe it to yourselves, to your children, to your friends and to your country. The poet Whittier has aptly said:

"The riches of the Commonwealth,
Are free, strong minds and hearts of health.
And more to her than gold or grain,
The cunning hand and cultured brain."

CULTURE IN THE HOME.

By MISS JESSIE KIPP, *Millerstown, Pa.*

In treating this subject, "Culture in the Home," I wish not only to present it to you in its narrowest sense or term, culture, but also in a broader one, "Education in the home."

Culture is derived from the Latin verb, "*colo*," which means "to cultivate," and refers not only to the act or art of tilling the ground, but also to improvement by effort. Culture, in a person, as we usually think of it, may mean a pleasing appearance, gracious manners, thoughtfulness for others, respect for superiors; these combined will make a cultured person and are really acquired only by much effort. It is not of this culture we wish to speak so much as improvement by effort which naturally must lead to the developing and cultivating of the physical, intellectual and moral faculties, which is education.

Broadly speaking, the whole of life is an education and life itself in all its phases is the great school. Every agency of civilization is an education. Every human situation is an educational situation. Living is itself learning. Life itself the school and the spirit of the world, himself the teacher. Two social institutions along with other functions are consciously engaged in education. One of these is the home, the other the church. Each of these has something else to do besides educate, yet neither can do its proper work without education.

Originally, the home was the centre and base of society. The home was society. Before the school, the church, the state, the home was. Within modern times the home has lost much that made it what it was; its duties have been given over to the school and church. Responsibilities which were once seriously assumed by parents have been lightly rolled off upon other's shoulders. Within the memory of some present, the home was a place of varied and vital activities. The father and the boys plowed, sowed, reaped; raised horses and cattle and sheep; dragged out firewood and lumber from the forest; drew or carried grain to mill and brought back bran, shorts and flour; they made and mended simple tools, and built houses and barns. The mother and the daughters baked, cooked, made butter, cheese, jellies; spun and wove; sewed and knit; learned and practiced millinery and dressmaking. What a place for educating the boy or the girl was the old time farm!

In every one of these activities there lay a summons to skill, a drawing forth of faculty, a demand for adjustment. In addition to these activities, there was the constant daily companionship and mutual co-working of parents with children. Life on the farm, in touch with the soil, furnished rare elements of education. In the home of to-day hardly one of the old activities remains, and in multitudes of homes, no new ones have risen to replace them. Work is "done out," or given over to hirelings or to machines, companionship is increasingly crowded out, instruction and even training are incidentally given over to outsiders; the center of responsibility in many cases falls outside the base of the home. The father who once was teacher, priest and patriarch is now too often hardly even father. "Doubtless the American home," writes one, "the very heart of society, out of which are the issues of life is falling further short of its moral and religious opportunity than any other social institution." But it does not follow that because home conditions are unfavorable to education, that educational results are unsatisfactory. There are in the home of to-day conditions more promising and more satisfactory than in the home of fifty years ago, because there are so many equivalents and substitutions for the old activities. The American boy and girl has the power of acquiring an education out of the most unpromising conditions. Moreover, because home conditions are so different from what they used to be, it does not follow, either, that they are necessarily worse. Adjustments are possible and it is possible to produce a better type of home life and a higher kind of education in the home of to-day than in that of fifty years ago.

There are two facts about the home that distinguish it, educationally: The amount of time during which it exerts its educative influence and the unprofessional character of those who constitute, so to speak, its faculty. In the first place, out of the first fifteen years of life, six are usually spent at home and out of the 8,670 hours which the children have to spend each year of the remainder, 7,760 are normally spent by them under the care and guidance of home; fewer than 1,000 hours being usually spent in school. It is clear that upon the home there rests a heavy responsibility for education. It is also clear that home education will have to do with laying foundations and with morality, taste and religion rather than with intellectual training and knowledge. More briefly, the home accomplishes its ends, educationally, not mainly by preaching, still less by setting lessons, but simply by giving old and young a chance to live and learn together. To be rich, home life must be full of activity and interests. It is evident that where there is nothing doing at home, there can be no education through activity, but where there is activity in which children can and do help there is created an educational situation of high value.

On the farm these situations are provided. Weaving, drawing, modeling, making articles out of cardboard, wood and iron, painting, gardening, are all appropriate and educative for boys. So are milking, churning, chopping, currying, fishing, tramping, camping. The care of living creatures is of high value in a boy's education. One had rather that a boy grew up ignorant of many facts of geography, of many rules in arithmetic, of not a few dates and battles in history than that he grow to manhood without having

experienced the loving devotion of a noble dog or other animals capable of devotion and without having learned to treat them with lovingkindness and intelligent care. Closely akin to these activities for character building are the planting and care of vegetables, flowers, bushes and trees. Gardening is a most, if not the most, ancient of occupations. It is also one of the most vital. The ever new and wonderful miracle of bursting seed and up-springing plumage, is something which educators whether at home or at school can by no means get along without.

Another phase of home enrichment depends upon the atmosphere and the ruling interest of the home. Where parents have the reading habit; where the best books are read; where the talk of the table is less about trivialities, and more about that which is permanently worth while; where the right parts of the right kind of a daily paper are discussed; where the children's interests of school and playground are given due attention at the proper times; where these subjects and many more like them form the staples of home intercourse, there results a type of home culture and education which nothing can replace. The heart and core of home life is mutual respect and reverence and love and the basis of these is companionship and service.

The final aim of education is, as Ruskin says: "Not to make a boy know what he did not know before, but to make him behave as he did not behave; and, again, education does not consist in making him good but in making him good for something and to prepare him for dealing with the problems of the future."

THE EDUCATION OF FARMER BOYS.

By DELROY MATTHEWS, *Drake's Mills.*

One of the most practical questions which is being discussed by our greatest men at the present time, is the education of our farmer boys. This idea of education seems to have originated of late, as a few generations ago it was deemed unnecessary for farmers to have an education, but experience is the best teacher and experience has proven that it is just as necessary for a farmer to have an education as it is for a lawyer. Now why is it? There are several ways of discussing the question. But taking it from a normal standpoint, we find that an educated farmer is looked up to as a leader in his community or township in both religious, political and other affairs pertaining to the welfare of the people.

How often we hear our people talking about the lack of education of some of our young men, but the only satisfaction is that they make farmers. But it is not only the point to make a farmer but to make a good one better than any other one in his community. Then again we hear that an educated person thinks it is a little too much like work to farm, but let us all remember that getting an

education is not all sunshine; there is considerable worrying as well as to other occupations. Teach your children to work as well as to study and a combination of both will bring better results than possessing only one. Then again, we find that a certain portion of our country boys dislike farming, and if they have no education, what are they going to do? Are they going to work in some coal mine or pick away at some railroad track, although there is always demand for such labor, you should always aim for something higher. It is just as honorable to be a farmer as it is to be a lawyer as there is generally more honesty connected with it.

But now why is it that so many of our young men make but small advancement in their education, with our country schools in the condition they are at present and the free tuition which now exists in our normal schools, there is but small excuse for the greater portion not taking advantage of these privileges. Why is it? Well, the first thing we would notice, that about one-third of our boys are smoking cigarettes or chewing tobacco, and a boy who follows these habits will prosper but little or prove worse than useless; but the most important cause is his attendance at school; we find some parents sending their children to school about three days in a week or allowing them to get to school from fifteen minutes to half an hour late and the consequences are that the boy grows up and becomes 17 or 18 years old and is in classes with other pupils of about 12 or 13. He becomes ashamed and quits school. This is the class of boys that a great portion of our farmers are made of.

One argument which is brought up against educated farmers is that they can farm better on paper and tell how things ought to be done better than they can do them themselves. There is a great deal of truth in this but the educated farmer ought and should not be any more afraid of work than the average farmer of this kind who is continually hiring help and has no outside income besides his farm, we generally find that he fails. Then we find that some learned farmers want to put themselves above their brethren and get in a hurry to acquire wealth and they go into other kinds of business with their farming and the result is that they neglect their agricultural pursuits, probably lose in their occupations and the result is that they have nothing left.

Our great thinkers tell us that it is coming to the time and age of the world when all should acquire a fair education and that all, no matter how rich or how poor, if they earnestly try, can succeed in acquiring a knowledge of the desired studies. But how much of an education does a farmer need? We might say that a knowledge of the common branches is all that is necessary, but we should get all that we possibly can; a course in a high school or normal school, and completed with a course in an agricultural school would be of great benefit to the average farmer.

Look at our Southern states where education is regarded as of small importance, and see the strife and corruption which now exists there; or compare them with our Northern states in manufacture and agriculture, and do we not find that these northeastern states are far in the lead. Notice the great race wars which occur in Kentucky or the great crowds of sinners who assemble to execute some negro criminal. Although he may deserve such punishment, yet they cast a blot on this great and free country of ours. Look at

other countries, as China, Egypt, or British India, and see how these poor people suffer in their wretchedness; and does this not prove that education is of the most importance. While we have made great advancement by the aid of our education, why can we not make greater advancement by still improving these advantages which we have before us.

Thus, we can plainly notice, both by observation and experience, that the education of our future farmers is a subject which is being discussed and is being carried out to a great extent, and that the knowledge which we now acquire will help us to fight the battles of life which are before us.

A TALK ABOUT FARMERS AND THEIR WIVES.

By J. C. RICHARDS, *Bald Mount, Pa.*

This life is full of earnest realities, and well and necessary it is that we engage in some of its occupations, to have some work to do in reference to the fulfillment of life's great object. It is only by work that we rightly come in contact with the stern facts of life.

Nature is full of activity; the sun shines, the winds blow, the lightnings flash, the thunders roll. These evidences of an all pervading activity in nature are but so many types of the energy and earnestness which should impel man onward to his destruction.

Work is necessary to our health if it be work that suits our natures, and of that character which will be of almost constant happiness in performing. It greatly depends on ourselves whether our work is a curse or a blessing if we are working for any selfish motive or only to see how much money we can accumulate; or if we are in a mistaken calling our work may become a drudgery and we slaves. Knowing this, we should very carefully choose the kind of work in which we are to engage, and should it be farming, we should with all our power make the most of it and each year improve on the past as we are constantly learning to better use the forces within us and the powers all about us. In no other occupation is there so much chance for change of work as in farming, although it may be more economical for a manufacturer to have each man day after day to do the same kind of work; as for example, to have twenty men make a saddle or a pair of shoes, yet if one man makes the whole he would be a whole man and not the twentieth part of a man. So a farmer with his varied tasks is a broad-minded man and not a specialist.

The farmer, to be successful, should put a great deal of cheerful whole-hearted devotion in his work. Half-heartedness does not count for much anywhere. There is no better place than on the farm to develop in a man patience, faith, humility and honest endeavor. If willing to cultivate these qualities, success is sure; it may not be from a money standpoint. Accumulating great worldly posses-

sions does not necessarily imply a successful life. Financial success does not alone bring peace of mind and contentment. The advantages of the wealthy are frequently overestimated, as is well illustrated in one of Dr. Lewis' lectures. He says how much more does the capitalist get out of his millions than a man of hundreds get out of his hundreds. The millionaire can not wear, as he walks the streets, a hundred coats, a hundred vests, a hundred hats, or a hundred pairs of shoes. When he sits down at the table he can not eat a whole roast ox, or two or three barrels of potatoes, couple bushels of turnips; in fact he rarely eats as much as his brother in poorer circumstances. When he dies, he requires no ten acre lot to bury him. The hole that his body will fill will be no larger than that required by a pauper who died in the poorhouse. His eyes can not penetrate further than mine, his ears can hear no better, his feet can run no faster, his life's enjoyment is no keener. The most we can get out of this world is lodging, clothing and board. In the light of various other testimonies, as Cornelius Vanderbilt, Stephen Girard, Depew and other capitalists and knowing the trials that merchants, lawyers, physicians and others in the various walks of life have to contend with, we may readily conclude that the farmer has as many possibilities for happiness as in any other occupation or profession.

Let no one feel that his lot in life is a hard one and his work unimportant, if on a farm, if there is much to be done that does not make show to the world. The reward may be only in the satisfaction of faithfully doing one's duty and making those around us happy. The farmer should not only take an active interest in growing better crops but in being better educated in his calling, and thus making him better fitted to fulfil his duties as members of society. To secure this end no education is too good for the farmer and his family. The home on the farm should be the place where the farmers' wives exercise their best gifts, where they may both sow and reap, and which is left for them to brighten and beautify or to darken disgrace. First of all, they should remember, that the farmer's house must be a true home and not merely a house. We have all seen careful housekeepers whose first and last thought was to keep their surroundings with absolute neatness. Overshoes must be put here, boots and shoes there, papers folded in their creases, the best carpets only trodden upon by strangers, curtains drawn or carpet would fade. These were housekeepers, not home-makers. The virtue of neatness we all know is the housewife's glory, but when carried to excess, becomes a shame, and defies family comfort and banishes the angel of peace from the home, and yet comfort, important as it is, is not the first and last aim in life. It is not all of life to love, for some in their excessive fondness for comfort for the children have become blinded, and allow those whom they might comfort to walk in evil ways and to those things which they ought not without putting forth a restraining hand. Says an indulgent mother: "I want my children to have a good time while they are young; they will see enough of this world's hardships before they die." There is no better place than on the farm to train children. If left to themselves they will grow up to be selfish, disagreeable, ease-loving, with hearts incapable of feeling any interest in any thing that does not immediately affect their physical comfort and

well-being. Mothers should not spoil their children and destroy the foundations of character. Let the children do errands and have work of their own and feel the responsibility of doing it. They should be taught a self-sacrificing spirit to feel that it is no hardship for them to give up personal comfort if it means happiness to others. The sacrifice should not be all on one side. It is not well for children never to be disappointed or to have their wishes always granted, at whatever expense. Exacting children should be made to wait upon themselves, to practice patience and self-denial. Many a man and woman lives to regret the lack of proper discipline in youth. Farmers' wives and their children should work together in harmony and remember that if the farm is the place in the workshop of life in which they have been placed, they did not come to that place by accident. It is the place God meant for them and in performing its duties they are performing the duties to which God called them. This alone gives dignity to the humblest work and the humblest life and if we are "diligent in business, serving the Lord," we will soon be called to something better.

THE EDUCATION OF THE BOYS AND GIRLS ON THE FARM.

By MRS. GERTRUDE CROPP, *Saegerstown, Pa.*

The education of the boys and girls should begin in the home, continue in the home and end in the home. There should be no time in a child's life that the parent does not take an active part in his education. What a child sees, hears and comes in contact with through the senses, makes the most lasting impressions. The parents should be very careful what they do and say before a child, for those little eyes are watching and those little ears are hearing all the time. There is nothing so important in all the duties of life as the early training of a child. So it behooves us to be ever on the alert to help the child and prevent him from forming bad habits of thought, speech and deed. The first thing that should be impressed on a child's mind is truth. Every care should be taken to teach him rules of hygiene: (that is to sit, stand erect and breathe deeply, keep his feet dry and habits of cleanliness, also moderation in eating and drinking,) proverbs of high moral standing and scriptural quotations, so that he shall enter his school life with a knowledge of caring for his health, conscientious principles and desire and thirst to learn. He should be taught to love and obey the teacher.

There are three things that we especially desire our boys and girls on the farm to possess. They are honesty, courage and brains; all of these traits can be developed in the home and schools. They must be honest in purpose, courageous in action and have a chance to acquire a fair education. We want graded schools and township

high schools where we can have our children with us all the time they are acquiring an education. Not graded schools where eight grades are taught with a like number of pupils, but where one grade or two grades are taught by a teacher thoroughly equipped for that grade. We want all the children conveyed to school in comfortable conveyances by a responsible person of high moral standing. I heard just the other day of the children in a certain precinct in a large city being taken out into the country to school and how their health was improved and their average standing in studies increased and how much good it did their morals, too, to come in contact with the beauties of nature. Now, if it will pay a city to do this, why will it not pay us to do likewise? Just so long as we hold the dollar higher in esteem than we do the boys and girls, just so long will we have to be confronted with the present conditions. The cost would be somewhat greater, but the results would be so much better, because the pupils and the teachers could co-operate with each other both as to methods of instruction and controlling the pupils. We do not care so much for fine buildings, although all buildings must be comfortable, well lighted, heated and ventilated, and pleasantly surrounded.

But we do want good teachers, those that know their work and have the faculty of diffusing knowledge, those that have every boy and girl on their minds, that are under their charge, that they may know just what they need, those that love the profession and have not chosen it as a stepping-stone. We have many good teachers in the country and many that are true to their calling but they can not do their work successfully when so much is required of them. I know of a teacher that has fifteen pupils and eight grades. She told me that it was just impossible for her to control the pupils, let alone try to teach them. There is no interest in this school because it is almost out of the question to become interested when there is no rivalry. The teacher is a most excellent teacher and she often sits up till 2 o'clock trying to prepare work for the various grades. This is just one case I could cite you of the many that are even worse off than this school because they have not so good a teacher.

Do let us think of this subject and see if there cannot be a great change in our district school. We can have better schools in the country than in the towns because we have better surroundings and pure influences. Let us do all we can to improve our schools so as to keep the boys and girls with us on the farm. And let us see that they have a good practical education. In the State of Missouri, teachers are required to be examined in agriculture before teaching. I know of no study that would be of so much interest and benefit to the children on the farm as simple lessons on nature and her secrets. Agriculture is the first and noblest of all occupations. There is no occupation in life in which we are brought in such close touch with nature and nature's God as the tilling of the soil. There is no occupation in life that we are so free from temptation, and enjoy so much of the real good things of life as on the farm. Perhaps some would challenge this statement, but I would be glad to argue on the beauties and independence of the farmer's life. I know we have to work, but where is there a successful life that does not work? Let us be loyal to our calling and teach the boys and

girls to love the farm and learn its difficult lessons. There is no occupation that needs so much patience, perseverance and real knowledge as the farmer. If we are to be the laborers of our country we want to be arrayed with her thinkers too. We want to develop such good, true men and women that they shall be capable statesmen, capable protectors for country, and capable home-makers. We want some of the future Presidents to come from the farm too. And with the right kind of educational advantages there would be a bright possibility for the future of the children on the farm.

The Romans had a saying, "It is sweet to die for one's country." This was a grand saying and a good motto, but I believe it is sweeter to live for one's country and try to influence the young to keep their lives true and noble. Let us all become acquainted with our teachers and learn their many good qualities. Many a good teacher has made a failure because she had not the sympathy and support of the parent and many a poor teacher has done good work when aided and helped by the parent. So let us do all we can to help the teacher. We must never be more interested in anything else than we are the boys and girls, and what concerns their welfare.

"The opportunities to do, they come at God's behest;
And they who never squander one,
Are they who live the best."

We should remember that each act of our lives has an influence on those that are intrusted to our care, and those with whom we associate.

Brothers, do you know that the little slip of paper you hold in your hand when you elect the school director may have the destiny of your child in its power. So then choose carefully a man for this office that loves the children and wishes to help them. Again, I say, the boys must have honesty of purpose and be courageous in action and know what to do and how and when and where. Honesty, courage and brains, these three, must go together to develop a true man.

"Life is a piece of paper white,
Where on each of us may write.
His line or two, and then comes night.
'Though thou hast time for just one line;
Be that sublime;
Not failure, but low aim, is crime."

THE FARMER'S DAUGHTER.

By MISS LOLA KUHNS, *Leeper, Pa.*

As we take up this subject of the "Farmer's Daughter," how many of us stop to think or realize what the life and enjoyments of the farmer's daughter are, or the unceasing pleasure she enjoys. We will go back to her tender years, say six years of age, when she is beginning to notice the world. She is just beginning her education and starting to school. We will see her tripping along with brothers and sisters, perhaps a mile or two miles to the nearest school. How delighted she is. Her rosy cheeks and sweet smiling face make her the pet of the school. She begins her education by learning her a, b, c's, from that to spelling and perhaps reading during her first

term. How glad she is when she can tell mamma what her reading lesson is about or the new words she learned to spell that day.

At the close of the first term of school she is quite a different girl. She has new ideas and new thoughts of which every one is a pleasure to her. She has become acquainted with all her little neighbors; she knows something of her surroundings and is now old enough to be of some use to her mother about the house. How happy she is going out with mamma to feed the little chicks or calves and see the snow-white lambs that are always found about the farm, with other boundless pleasures which her city cousin knows nothing of. As she grows older many new pleasures and privileges arise before her. She lives in ecstasy from the blooming of the first fragrant blossoms of spring until the ripening of the delicious fruits in autumn. How eagerly she helps gather the many kinds of fruit that lie in abundance around her. This work and pleasure over she is now looking forward to the commencement of school again when she will meet all her former acquaintances and have such good times.

It is almost impossible for me to illustrate to the city girls who are present to-night, with what pleasure the farmer's daughter looks forward to the opening of the school term. Many of our schoolmates we do not see from the time school has closed in the spring till it opens in the fall. We have had sufficient physical exercise during vacation that we look forward to school, not as a place which the law compels us to spend six hours a day for five days in the week and 28 weeks in the year, but as a place where we can gain a great deal of knowledge as well as have a good time. During the school term our evenings after supper are not spent coasting or attending parties but with our books. The farmer's daughter centers her mind on her lessons during the school hours and spends from one to three hours each evening of school days preparing her lessons for the next day. This answers the question, Why a farmer's daughter in nine cases out of ten has a more thorough understanding of the branches taught in public schools at the age of fifteen than her city cousins. This goes on from year to year and we will leave her to enjoy herself as she passes through her school years and childhood days.

We now have before us a rosy cheeked, plump, healthy girl of eighteen summers. She is all joy and laughter and is practically "boss" of the surroundings. She superintends the greater part of the housework which mother has intrusted to her. The work is not hard for her. She has grown up with it and knows just what to do and how it should be done. We see her on a May morning as she trips down the pathway to the farmyard with a pail on either arm, her rosy cheeks all aglow, singing some familiar song. The cows know her voice and come to greet her. After milking the cows she tends to the milk and feeds the young stock. All this is a pleasure to her as it helps support all in the family.

She has a fair education, is healthy and has many advantages over her city cousins, who are penned up in the smoky city.

But I do not wish to take up too much time. While there is much to be said in favor of the farmer's daughter, I will only draw a few more sketches. You will see her on Sabbath morning on her way to Sabbath school or church. She is seldom ever in a closed car-

riage, but in any sort of a conveyance that will carry her, and she is perfectly happy. She can act as teacher and sing in the choir. Her eloquent voice and firmness of character make her a controlling power to those around her. She is consulted on many subjects and can discuss any of them. Her sentiments, combined with a strong voice, compel those listening to regard her as one having authority.

Is it necessary for me to explain to you why the farmer's daughter is nearly always married between the ages of 18 and 21. Because they know how to work, how to economize and how to make a man happy, and those are the kind of girls the young men are all looking for. When a young man grows hungry for a meal like mother used to cook, does he call on his city friend who spends one-fourth of her time reading cheap literature; another fourth of her time standing before the mirror and perhaps the greater part of the forenoon in bed while mother does the work. No. He goes to the country home where mother and father entertain him while the daughter prepares him a dinner of chicken, fried so tender and brown it almost melts in the mouth, also flaky biscuit, delicious preserves, golden pumpkin pie, rich cream and sweet butter, all prepared by her own hands. Dinner over and the kitchen put in order, he has the pleasure of discussing with her the most noted authors or the happenings of the week and listening to her play and sing those good old familiar pieces we all love so dearly.

A gentleman who was compelled to remain in the city a few days, told me that he decided to call on a family living there with whom he had been formerly acquainted. The daughter had just returned from college, having finished her education.

He asked her to play for him. She played a few rag-time pieces quite well. He then asked her to play "Home, Sweet Home." She stumbled through it, almost pounding the keys of the piano to pieces. She tried other familiar pieces, which he mentioned, but with the same effect. He then asked her if she could cook. "Oh, yes," she said "but we called it culinary." She kindly consented to make soda biscuit for supper. He afterwards said he was very glad he was not compelled to make a supper of them. I defy any of the instructors or visitors present to-night to have an incident of that kind to relate concerning the daughter of any farmer they may have spent a few days with during their travels. I hope I have not said anything to offend any city friends who may be in the audience to-night, for we all know there are many dear girls who are not responsible for the position they occupy; but when we take everything into consideration and extract the compound interest, everyone will be compelled to admit that the farmer's daughter is the girl.

THE SUCCESSFUL FARMER'S WIFE.

By MRS. A. P. HAZEN, *Ellwood, City, Pa.*

The successful farmer's wife needs as qualifications: First, intelligence, second, strongmindedness; third, economy; fourth, progressiveness; fifth, success as an educator.

We think of no other occupation in which men are engaged where the wife is so completely a partner as on the farm. On the farm, the home and place of business are one. The wife should be intelligent enough to thoroughly understand all business details. The farmer does not treat his wife fairly when he withholds from her important transactions. We will say nothing about the manner in which our sex conduct an argument. The intuitive judgment of women is often more to be relied on than the more elaborate reasoning of men. No man who has an intelligent wife will dispute this. When Columbus laid a plan to discover a new world, it was a woman who enabled him to carry it out. We do not find the children of the intelligent farmer's wife anxious to leave home, to go to the city, or to find something to do so as to escape so-called drudgery on the farm. She is a successful home-maker. When necessity takes the children from the home nest, they go fitted for the new life. They go out into the world with the full belief that there is no place like home.

The farmer's wife must be strongminded, have will-power. Without will-power she is liable to become a drudge, a mere machine, allowing herself to forget all education or accomplishments she may have possessed. Her trials are many. She has need of a will which is monarch of the mind, giving directions to all its movements. She must study and practice economy. Study to economize strength, time and money. That great moralist, Dr. Johnson, asserted that where there was no prudence there was no virtue. It is no one's duty to deny herself every amusement, every comfort, that she may get rich. There is an economy that becomes a duty. It takes but a small per cent. to make the difference between profit and loss. One of the greatest obstacles to success is the unnecessary expenditure of money for articles for the family. There is no economy in buying matches, two boxes for a nickel, when she can get a dozen boxes for a dime. There is no economy in paying agents from \$35 to \$50 for a sewing machine that can be had for about half the money by co-operative buying. She should become a member of some farmers' organization and thereby purchase direct from the manufacturer. She should become a working member of the organization, for it is important to her success, financially, socially and intellectually.

The farmer's wife should be progressive. She should strive to advance onward and upward to a higher plane. There is much said about woman's advancement in the press of the day. Many of the one-ideal women harp so continually on woman's wrongs, that their weaker minded sisters appear to believe they are in some manner abused. The greater part of them could not intelligently explain how or by whom. They attempt to punish the world in general by whining over and magnifying all the troubles they ever had or expect to have. No one can make any progress in this way by bewailing her condition. If I were advising I would say her progress would be best promoted by cultivating a spirit of contentment. Many women waste twice as much strength and nerve force fighting against their destiny as would be required to bear it patiently. Some of woman's greatest grievances are that they dislike to cook and to sew. They are tired of housekeeping cares, and children are wearisome. Many seem to think they should be delivered from whatever they dislike. To be progressive farmer's wives should

read more than they do. They should be acquainted with history, discoveries, inventions, religious tendencies, politics, current events and all that go to make up every-day life. I would say to every woman whose time is limited, read the newspapers. One weekly or even a monthly, well read and thought over will keep her informed upon the most important events. The progressive woman of to-day should be equal to any emergency and still not lose her womanly dignity. Her descendants then may be able to say, "She met the wants of the times, and was modest enough not to exceed them."

The farmer's wife should be an educator. She should be thoroughly educated herself, not only as to the needs of the home and family, but of the commercial, intellectual, moral, religious and political wants of the nation of which she forms an important part, if not the most important part. It is an old maxim that "the hand that rocks the cradle, rules the world." If that be true the responsibility that rests on the farmer's wife is not to be sneered at or evaded. The hand that rocks the cradle in the farmer's home rules or controls 40 per cent. of the population of the United States. The qualifications for her educational work cannot be obtained in the ball-room, card parlor or dime novel. Neither can it be obtained by a school education, no difference how thorough it may be. It can only be obtained by constantly replenishing her stock of knowledge by observation, reading, thought and honest discussion. It is when thus educated she is the true helpmeet of man, with mutual interests. She is his counsellor and friend, always in his confidence. Of the two, she is undoubtedly the more spiritually inclined. She will stimulate the noble qualities of their little children and guide and instruct them in the path that leads to a higher life when they have grown to manhood and womanhood. She needs to be qualified to be their counsellor, in their business, political and religious needs when the responsibility is greater than when they were babies in the cradle. If she be qualified to instruct her family, as to church and state, then why not have an equal voice in saying who should rule, or by what form they should be governed? Why should she not enjoy equal rights with them? If she is qualified to instruct, why not qualified to act?

Perhaps some will say she is getting out of her proper sphere, that it is her duty to teach her boys to plow and her girls to cook and wash. Who were Washington, Jefferson, Jackson, Clay, Calhoun, Benton, Lincoln, and Garfield? Were they not the sons of farmers' wives? Who first instructed them in the line of duty? Certainly the one whose hand rocked the cradle preparatory to the training of these boys, whose names have made an indelible mark on the pages of the world's history and in the hearts of American patriots. Wm. Hornaday in his "Two Years in the Jungle of the Dyaks," describes a native race of Borneo, untouched by the light of modern civilization, where the woman is considered the superior of man except in hunting and fighting. She is treated well and her advice is asked in all things of importance. Each man has but one wife and infidelity in marriage is almost unknown. The marriage of relatives is prohibited and great care is taken of the boys and girls. Among the Persian Aryas the wife and mother is still held in honor as being God's chosen instrument. She is regarded as superior to man and to this day is called the transmitter of life.

The announcement made to Mary, the mother of Jesus, respecting the birth of Christ is a strong restatement of the faith of the Aryas. Our country might borrow ideas from those barbarians respecting the rights of women.

If this nation has not attained that standard of development it should have, is not the farmer's wife to blame? Has she not neglected her duties by failing to be educated and educating her children as she should have done? Nothing distinguishes the real advancement of a nation so much as the position held by the women. Where woman is held in reverence, wherever she is the equal of man, bearing her full share of responsibility of the home, equally interested in the welfare of her country, there we shall find mankind in the highest state of development, the government the most enlightened and liberal. The stream can not rise higher than the fountain. The fountain of our country is the home. The home, that grand step that was made from nomadic life to an intellectual and spiritually operated one, by the aid of the light of God's truth the beginning of civilization. It was of divine origin, an institution established by Almighty God for the benefit and advancement of mankind, and woman, especially the farmer's wife, is the moulder of the home.

FARM HYGIENE.

By DR. H. B. ANDERSON, *Andersonburg, Pa.*

That department of medical science which treats of the preservation of health; a system of principles or rules designed for the promotion of health, is farm hygiene. The subject as assigned to me by our worthy committee, which mainly consists of a number of farmers, retired and active, with the exception of one person, and that one of my own chosen profession, who has spent years in medical practice among the hygienic, as well as the unhygienic, could have portrayed the picture of happiness resulting from practicing hygienic methods, and the miseries caused by not heeding the rules of hygiene, more clearly than can I of less mature years. Farm hygiene may be taken to include, everything connected with the farm, and the farmer, as I shall view him or her to-day, shall be the garden farmer as well as the man who tills acres.

First, I shall consider location of buildings on farm. The house to be placed so as to be convenient distance from the barn, so that the good people who are to carry the burdens back and forth from house to barn, and the reverse, and be wearied by distance; next look carefully to means of access to house, do not build great high porches, that must be ascended and descended by steps innumerable as the rounds of Jacob's ladder reared heavenward, as nothing wears more on the housewife's health than having to tramp up and down this life destroyer. Build your house so that your porch may be one or two steps from the ground, and sufficiently long and

broad enough so that your farmers and your wives and children may sit or play upon them during your leisure hours and thus breathe in and out God's precious blessing plenty of good fresh air, for I well remember, when a student of medicine, these words clearly spoken, "The American people are too lazy to breathe right, hence the great amount of consumption and other bronchial troubles in our country." Look well to building a good warm house; need not necessarily be so expensive, yet it can be arranged to build it comfortable, with ornaments for show or not, according to taste of owner, but be careful not to interfere with proper ventilation, windows should lower from the top in nearly all the rooms, if not all, as a means of ventilating properly the rooms, both living and sleeping apartments. I see in my travels over this beautiful landscape many houses, the shutters of which are never opened, as those of the farmer's parlor, or a good spare room, which never receive any sunlight or fresh air, only when John woos Mary, the farmer's marriageable daughter, or when uncle Dick and his wife make us a visit, and breathe the same air that they breathed and rebreathed while sleeping in the same spareroom sometime ago. The great cure for tuberculosis and her kindred bronchial affections in our human race, are brought about by our fresh air sanatoriums, which are not robbed of pure golden rays of sunlight either. Farmer, ventilate your living and sleeping apartments freely and thus live a pure hygienic life, free from the miserable aches and illness brought about by unhygienic methods as improper ventilation.

Cellar drainage, if there be a cellar, and a house without a cellar, is only a half-house, is very essential to keeping up the health standard. I believe that every cellar can be drained if gone about in a consistent and persistent manner. Then, too, the cellar of the house should not be made a storage-room for decayed fruit and vegetable matter, from which emanates foul odors which may alone cause severe cases of the most malignant diseases. It should be aired frequently and all noxious matter detrimental to health removed therefrom. Next, we shall consider the cleanliness of the house both inside and out. There is plenty of water, soap, sand, brooms and other utensils necessary for keeping the palace clean, whether it be the poorest hovel along the mountain, or the finest palace in the dale. Heaven shall smile upon that housekeeper who prides herself in cleanliness of her house and shall consider her a jewel fit to place in the starry firmament above. The male portion of the household, as well as the boys and girls can assist in keeping the house bright and cheerful, by being clean. They may assist in arranging the outside of the house, the yard can be planted with a few choice shade trees, flowers of different varieties, but be sure not to make your yards, orchards of fruit of all kinds. Let all who reside in their house clean and be clean forever, do not forget the bath, which is a necessity, as bugs, insects and germs like to frequent a place best suited for their habitation, and thus disease lurks in about this human frame by being unhygienic about your person.

Now, let us go to the barn, which should be a modern building, with its equipment equally modern. Cleanliness should be carried through all the departments, so that the health standard of the occupants of this home shall not be lowered; the barn should be

warm as to its stabling quarters, for a two-fold reason, viz: Less grain will be needed to keep up normal body heat, and diseases incident to cold prevented.

Let us look at the placing of outbuildings. Convenient outbuildings are essential to follow out the rules of hygiene. No outbuilding should be placed where its drainage will interfere with the water supply of the home, as contamination of the water supply is dangerous to health. Drinking water, to be pure, must be colorless, tasteless and odorless.

The farm, in general, must be cleaned up, as noxious weeds, briars, and thistles are detrimental to growing crops, their proper harvesting, and their sale, and in all make farmers weary, care-worn, anxious, and finally sick, because their next neighbor is not a "Peter Tumbledown" like themselves, but a free, careful, industrious, through-going, modern farmer, with the glow of health upon his cheeks, and a cheerful smile that lights up his wife's countenance, and the rollicking girls and boys, because they live and practice—Be Clean.

WOMAN'S SHARE ON THE FARM.

By MRS. FLORENCE GATES BOYER, *Springboro, Pa.*

What is woman's share on the farm?

The first to be considered under this title is her share of the work that always is to be done on the farm. Every farmer's wife has many duties of which the women in cities or towns have not the least thought. Every one has her own individual work to do and no one knows all well as she does, what that work is. Now because it falls in the share of one to feed the hogs, poultry and calves, help with the milking and the many chores that have to be done on the farm, it is no sign that such must necessarily be the share of every farmer's wife. I believe some women do their share and then are generous enough to use their time and strength in helping their husbands and all because they will let her do so. For my part I can not think of anything so mean as a man who will let his wife do a share of his work. I once knew a woman with three small children, who had to split her own wood or go without, and many a time when the husband was in the town spending his money for drink, has she been compelled to take her children to bed to keep from suffering with the cold. I really think such a woman has a double portion for her share of the work on the farm.

And should a woman share the profits of the farm? She most certainly should, for the simple reason that she helps to earn them. Although the old saying that "a woman can throw out with a spoon as fast as a man can throw in with a shovel," may be true in a few cases. In the majority of homes you will find that it is the wife

who saves the pennies and you know if you take care of the pennies the dollars will take care of themselves; therefore, the women save the dollars.

In how many homes do you suppose the wife is consulted when there is produce to be sold or farm implements to be bought? I am afraid most men take the management of the farm into their own hands and consider their wives merely silent partners.

How many times do you suppose a woman buys anything for the home without first asking her husband's opinion? If a woman shares in the work of the farm why shouldn't she share in the management of it?

And again, when there is a little spare money how often do the wives take a vacation? In most cases the husbands go on some pleasure trip or make a much talked of visit to some distant part of the country and the wife stays at home to take care of the children or cook for hired help or do the hundred and one things that seem so necessary for her to see to herself. Has she not as good a right to a vacation from her home duties as her husband from his farm work? I know of a good many farmers' wives who did their share of the work all last year without a word of complaint, but when the question came of spending a few days and a few more dollars at the Pan-American Exposition, did the women go and the men stay at home? No.

The women stayed at home to keep the wheel turning and the men went to the Exposition. Of course they enjoyed the trip and derived more benefit than the women could and thus they (in their opinion) made the very best use of the money their wives helped to earn.

Now it is my opinion that if a woman performs her share of the work, she should equally share in the management of it, and in the ownership of the property, also in the disposal of it.

She should share equally in the luxuries that fall in their lot, and also be willing to share the losses and burdens of life.

FIRST REPORT

OF THE

BEE-KEEPERS' ASSOCIATION

OF PENNSYLVANIA,

HELD AT

HARRISBURG, PA., DECEMBER 6 and 7, 1904.



THE PENNSYLVANIA STATE BEE-KEEPERS' ASSOCIATION.

OFFICERS FOR 1905.

PRESIDENT.

Prof. H. A. Surface,Harrisburg,

VICE PRESIDENTS.

E. E. Pressler, Williamsport.
W. A. Selzer, Philadelphia.
J. N. Prothero, DuBois.

SECRETARY.

Rev. D. L. Woods, Muncy.

TREASURER.

E. L. Pratt, Swarthmore.

EXECUTIVE COMMITTEE.

Richard D. Barclay, State College.
Charles N. Greene, Troy.
E. F. Phillips, Philadelphia.
E. A. Dempwolf, York.
John D. Costello, Harrison Valley.

CONSTITUTION OF THE PENNSYLVANIA STATE BEE- KEEPERS' ASSOCIATION.

Article 1.—Name.

This Association shall be known as the Pennsylvania State Bee-Keepers' Association.

Article 2.—Object.

The object of this Association shall be the promotion of scientific and practical bee culture, and the securing of such legislation as is necessary to protect and further the bee-keeping industry, and to advance the interests of its members.

Article 3.—Officers.

The officers of this Association shall be a President, three Vice-Presidents, a Secretary, a Treasurer, and an Executive Committee of five members, all of whom shall be members of this Association.

Their duties shall be such as usually devolve upon the respective officers of similar associations.

Article 4.—Membership.

Section 1. Any person complying with the regulations of this Association, and paying one dollar yearly to the funds thereof, at any time, shall be a member, and shall be entitled to vote at the annual election of officers, and to participate in the deliberations of the Association, and receive the publications of the same, and also by so doing shall be a member of the National Association, entitled to its publications, legal protection and benefits.

Section 2. Any person interested in bee culture (including ladies) may become honorary members by a majority vote at a regular meeting.

Article 5.—Meetings, Election and Quorum.

Section 1. A meeting of the Association for the election of officers, transaction of business, presentation of papers and the discussion of topics of interest to progressive bee-keepers shall be held annually at such time and place as the Association shall direct.

Section 2. Special meetings may be called by the President and Secretary.

Section 3. Seven members shall constitute a quorum for the transaction of business, but a less number may enter upon a discussion of important topics and adjourn to some future day.

Article 6.—Amendments.

This Constitution may be amended by a majority vote at any annual meeting, of which amendment, 30 days previous notice shall have been given, in writing, to every member of the Association.

PREFATORY.

By HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

There is at the present time no more common subject of complaint among farmers than the scarcity and consequent high price of farm labor; and it therefore seems like a very opportune time to call attention to the industrious little toilers who are ready to work with untiring energy for all who are willing to provide them with good homes and healthful surroundings, and who make no greater demand for payment for the service they render than that they may retain for their own use enough of the wealth they accumulate to provide for their own subsistence and comfort.

Bee-keeping is regarded by those who have given the subject careful and painstaking attention, as being profitable, as well as productive of much pleasure. The demand for honey at the present time is largely in excess of the supply, and there is very little reason to believe that our markets will ever be over-stocked with the golden nectar so grateful to the palate, and still less reason to fear that the supply of pasturage for the busy workers that gather it may ever run short.

The State of Pennsylvania abounds with the richest sources from which great supplies of honey may be drawn. On every hand, in forest and field, in valley and upon mountain top, the benevolent hand of Nature is holding out these supplies and inviting all who will to send out ready workers to gather them in. Beginning with the arbutus and maple in the early spring and ending with the asters and golden-rod in the late autumn, a constant variety of flowers yield their sweet treasures to the cheerful laborers, who never tire while there is work to do and weather fair in which it may be done.

Why then should we complain that help is hard to secure as long as we are unwilling to set to work whole communities of these busy toilers, who, when tried and properly cared for, have never violated the confidence of their friends.

It is a source of gratification to this Department to know that interest in Bee-Culture is reviving and that we have in the State of Pennsylvania an active Bee-Keepers Association. This Association was organized at Williamsport, Pa., on the 12th day of April, 1904, and held its first meeting at Harrisburg, December 6 and 7 of that year. The addresses delivered and the papers read at that meeting are of too much value to be lost, and in order that they may be preserved, they are published in the Annual Report.

INTRODUCTION.

By PROF. H. A. SURFACE, *Economic Zoologist.*

There are certain facts about bee-keeping in this State, which are not generally known or considered, and I, therefore, take the liberty to outline some of them here, as I am in recent review of this subject and conversant with such facts, because they are in the line of my specialties.

There are about 28,000 bee-keepers in the State of Pennsylvania, and if each of these have three colonies (hives or "skeps") of bees, which is a low estimate, this means that there are 84,000 colonies of bees, and if these be worth \$3.00 per colony, which is also low as a fair average, considering that modern hives cost from \$2.00 to \$3.00 per hive alone, it will be seen that the State of Pennsylvania has over \$250,000 in the value of bees alone, and certainly \$100,000 or a great deal more, in bee fixtures and apiary supplies. The annual production of honey in Pennsylvania is not less than 1,000,000 pounds, and at 15 cents per pound, this amounts to \$150,000, making the value of bees, bee fixtures and honey in this State per year more than \$500,000. This is, indeed, a low estimate, and is beyond any doubt very clearly within the bounds of accuracy. When we consider that there are some men in this State, such as Mr. O. C. Fuller, Turbottville, Pa., who has presented one of the papers submitted in the following pages, who are making bee-keeping their sole occupation, we can see that there are great possibilities of this comparatively undeveloped side-line of agriculture. There is no business connected with the production of food or clothing for mankind which, if properly handled, will give such a large percentage of income for so very small investment.

With the 84,000 hives of bees in this State, the production of honey in this Commonwealth by skillful bee-keepers could and would be made to average at least one hundred pounds per year for each colony, and this would mean over seven times as much honey production as there is at present. Our agricultural people are missing this income, because they are not familiar with the science and art of Agriculture or Bee-Keeping. Thus there is a loss of over 7,000,000 pounds of honey per year to the citizens of this State, which means a value of over \$1,000,000, on account of the ignorance of modern methods that have been proven by man to be as certain as the latest and most beneficial methods in horticulture or agriculture.

There is also an annual loss of at least one-fifth of the swarms in this State at swarming time, through the lack of knowledge of the methods of preventing the bees from escaping at such time, and this amounts to about 17,000 colonies. Counting these as worth \$2.00 per colony, when the swarming is lost through failure to clip the wings of the queens and otherwise adopt modern methods in bee-keeping, it is a drain of at least \$34,000 per year, through loss by escape from swarms.

From a recent report from Canada we have statistics that eighty per cent. of bees of that country were lost through winter killing. In this State every person who has attempted to keep bees knows that we are below the possible accurate estimate when we say that one-third of the bees of Pennsylvania have died by "winter killing," or as many as 33 1-3 per cent. are lost from this source each winter. This means at least 16,000 colonies, with a value of \$3.00 per colony, making about \$84,000 loss by "winter-killing." Nearly all of this can be prevented by up-to-date methods. Bee-keepers who understand modern methods lose but few from this source, while farmers generally lose at least one-half of their bees during each winter. This shows that a knowledge of the methods of keeping bees is very important.

Also, a very destructive bee disease, known as Foul Brood or Black Brood has broken out in some parts of this State, and has destroyed no less than 10,000 colonies of bees, and possibly three or four times as many. The least value of the bees annually lost by diseases, moths, etc., must be as much as \$30,000, and this makes the grand total of loss of bees and honey in this State as much as \$1,200,000.00, upon a basis of computation that will not be denied nor challenged by persons who are really familiar with the subject.

Bee-keeping in the State of Pennsylvania is seriously neglected, while in other states it is receiving a considerable amount of attention and is developing accordingly. For example, in the State of New York there are several State inspectors for the disease known as Foul Brood, and a very active New York State Bee-Keepers' Association, which annually holds a series of Institutes in Bee-Keeping in various portions of the state, which are maintained by state appropriations, the same as Farmers' Institutes. This is resulting in greatly increasing the production of honey within the region embraced. Pennsylvania has the fruits, blossoms and cultivated and wild flowers holding nectar for far more than the annual production of honey than is now obtained, and she has sufficient persons engaged in bee-keeping to make her honey production very remarkable; but there are two things that are neglected: (1) Knowledge of the real principles of bee-keeping, and the methods of honey production, marketing, etc., and (2) failure of our bee-keepers to put such knowledge into practice; or in other words, negligence of the bee-keepers to follow scientific instructions and apply the principles involved in the science of Apiculture.

The papers published in this Report are those presented at the First Annual Meeting of this Association, held at Harrisburg in December, 1904, and as they are by persons who fully understand their subjects, and pertain directly to bee-keeping in the State of Pennsylvania, it is quite appropriate that they should be published by our State Department of Agriculture.

FIRST ANNUAL ADDRESS OF THE PRESIDENT OF THE PENNSYLVANIA STATE BEE-KEEPERS' ASSOCIATION.

BY PROF. H. A. SURFACE, *President*.

In attempting to deliver this, the first annual address of the President of the Pennsylvania State Bee-Keepers' Association, I deem it important to give a brief resumé of what we have accomplished during the portion of the year that we have been in existence, and to indicate some of the important work that is before this Association. I hold in my hand a circular concerning the organization of our Association, which contains the following statements:

"Pursuant to a call for a convention of the Bee-Keepers in Pennsylvania a number of persons met at Williamsport on April 12, and organized the Pennsylvania State Bee-Keepers' Association with the following officers: President, Prof. H. A. Surface, State College; 1st Vice President, E. E. Pressler, Williamsport; 2nd Vice President, W. A. Selzer, Philadelphia; 3rd Vice President, J. N. Prothero, DuBois; Secretary, D. L. Woods, Muncy; Treasurer, E. L. Pratt, Swarthmore; Executive Committee, Richard D. Barclay, State College; Charles N. Greene, Troy; Prof. E. N. Phillips, University of Pennsylvania, Philadelphia; E. A. Dempwolf, York, and John D. Costello, Harrison Valley.

"The chief purpose of this organization is to promote Apiculture in Pennsylvania, and it is to be accomplished by efforts made along the following lines: (1) To secure legislation for the promotion of bee-keeping. (2) To suppress the diseases of bees, especially foulbrood, by legislation and by the appointment of a competent State Inspector with deputies or assistants. (3) To secure and promote instruction in bee-keeping at Farmers' Institutes. (4) To secure a series of lectures at the normal session for Farmers' Institute Lecturers to be held in Bellefonte next October. (5) To make it possible for persons to obtain instruction in apiculture at the Pennsylvania State College. (6) To induce and promote investigation and experimentation in apiculture at the Pennsylvania State Agricultural Experiment Station. (7) To induce and promote investigations and publications by the Division of Zoology of the Pennsylvania State Department of Agriculture. (8) To enforce the laws against the adulteration of honey. (9) To secure laws against spraying fruit trees while in bloom. (10) To obtain statistics concerning bees and bee-products within our State. (11) To enter upon a crusade of apicultural education in this State, both for producers and consumers of honey. (12) To instruct fruit growers and farmers as to the practical value of bees as fertilizing agents for their plants, and to show the fact that they are wholly beneficial and never injurious. (13) To raise the rank of Pennsylvania as a honey-producing state from fourth in the Union to first, if possible. (14) To band together all the bee-keepers of the State for the purpose of good fellowship and that strength, which is to be obtained only by union. (15) To make it possible for all persons who are not now keeping bees to add to

their revenues by the production of honey, and to increase both the quantity and quality of the honey produced in this State.

"The Association desires the name and address of every man in the State who has one or more colonies of bees, and for this purpose invites persons to correspond either with the President or the Secretary, stating the number of colonies or hives kept, and giving statistics as to the amount of honey and wax produced each year. The membership fee is only one dollar per year, which also entitles the individual to membership in the National Bee-Keepers' Association, and gives him special protection and assistance at any time that it may be required. For example—if a member of the National Association becomes involved in litigation the National Association will furnish expert testimony and counsel such as may be necessary to secure equity in the courts of justice.

"This commendable undertaking should receive a large membership, and all persons interested are invited to send their names, addresses and fees to the secretary, and these will be registered and received.

"The next meeting will be held in Harrisburg during the first week in December, when several papers will be presented by practical and expert men, bearing upon the various problems of the bee culturists in our State.

"Correspondence is earnestly solicited.

"D. L. WOODS, Secretary,
"Muncy, Pa.

H. A. SURFACE, President.
Harrisburg, Pa."

Some of the objects cited in the above circular have been already obtained. For example, we have secured the instruction of bee-keeping at Farmers' Institutes in this State, and any institute that desires a special lecture or series of lectures upon this subject by a practical expert, can obtain them, without additional charge, by corresponding with Hon. A. L. Martin, Deputy Secretary of Agriculture and Director of Institutes, at Harrisburg. At the Farmers' Normal Institute of this State, held at Bellefonte and State College last October, one of the most interesting addresses, which received universal commendation, was upon "Practical Methods in Bee-Keeping," by Mr. R. D. Barclay, of State College. This shows the accomplishment of item No. 4. To meet No. 5, Dr. Atherton, President of the Pennsylvania State College, is preparing to offer a course including instruction in bee-keeping for young women and men who may wish to make a professional and practical study of the so-called "side issues" of farming, fruit growing, poultry keeping, bee-keeping, berrying, floriculture, etc. The fact that the proceedings of this meeting are to be published in the Annual Report of the State Board of Agriculture is enough to show that the purpose set forth in item No. 7 is also to be met. A series of lessons in Apiculture has been prepared and issued in the Correspondence Course of the Pennsylvania State College, and as these are free to all persons who want them, this bespeaks an additional scope of our educational influence in connection with the College and the Experiment Station. Preparations are now being made for the speaker to establish an Apiary at the Pennsylvania State Agricultural Experiment Station, and thus to accomplish purpose No. 6. To secure the legislation mentioned in the above circular demands uniform effort,

and I recommend that steps be taken in this convention to draft and secure the passage of such bills as we may agree upon. Concerning the adulteration of honey I have to cite such an example as the following: Shortly before our organization last spring I purchased so-called liquid honey at twenty-five cents per pint, which I knew was mostly glucose, because it had neither the flavor nor sweetness of honey. It was, of course, extracted and adulterated afterwards.

A few days ago I went into the same store and examined the same preparation and found over the original label a more recent one had been pasted, upon which was printed "Honey Mixture: one part honey, two parts glucose." This jar sold for only fifteen cents, although it was exactly the same in every particular as that for which I had formerly paid twenty-five. This means that the value of pure honey is to be maintained by exposing frauds and adulterations and enforcing the law and compelling these cheap substances to be sold for what they are, rather than in competition with the genuine article.

In Pennsylvania there are about twenty-eight thousand beekeepers, who produced last year about two million five hundred thousand pounds of honey, and which would load a freight train one mile in length. Our State has not usually been regarded as a great honey-producing state because this subject has not been properly brought before the public. Today the field is open, the ground is fallow and the soil is fertile; it remains for us to plant and cultivate the seed which will result in good fruit for ourselves and future honey-producers. Let us be encouraged by what has already been accomplished in less than a year, and push forward with the expectation of increasing our membership, and securing the other aims of our organization. In Union there is strength.

Before us is a crusade of education which demands the energy and attention of every intelligent person interested in bee-keeping or honey production. This is to be fourfold, as follows:

I. The Education of the Public.—(1) The public should be educated to know the true value of pure honey and its medical, health-giving and health-preserving qualities. Since it is a food-stuff already pre-digested, being an inverted sugar, and prepared by the bees ready for digestion to be completed in the human stomach, it can in many instances be eaten by invalids when other sweets can not be taken. Honey is to be found upon my own table every day, and if I were to speak from personal experience I should say that I am sure our appetites are keener, our food more highly relished, our health much better, and our bills, especially for butter and meat, considerably reduced by virtue of the use of this important product of the bees. (2.) We must educate the public in the evils of using adulterated honey, which although it may contain such an apparently harmless adulterant as glucose, has not the sustaining qualities of honey. (3.) We must impress upon our friends the fact that comb honey can not be made artificially and can not be adulterated, and consequently in buying capped or sealed honey they are buying that which has been prepared only by the instrumentality of "The Little Busy Bee." (4.) We must also educate the public to understand that honey in the store-room may be granulated, although pure, and in fact granulation or sugaring, especially in cool weather, is an evidence of

absolutely pure honey. We should educate them to understand that the most suspicious product on the market is the extracted or liquid honey in jars with a little piece of comb floating at the top. No true bee-keeper ever prepares his product in this way. (5.) Our friends should be educated on the subject of buying honey. They should know where to buy it, and when they learn this they will agree that buying directly of the producer is the best way to obtain the best product at the lowest price. However, it is possible for us to establish in the large trade centres of this State a regular trade with certain firms who will make their reputation and ours by handling our products in a reliable manner, which will prove satisfactory to both producers and consumers. (6.) We should use every effort to show the absurdity of the canard or false statement, now unfortunately being circulated in some papers, to the effect that there is manufactured or artificial comb-honey. Let us emphasize this by making known the fact that the National Bee-Keepers' Association, of which we are members by virtue of having joined the Pennsylvania Association, has a standing offer of one thousand dollars forfeit for any comb honey capped or sealed in such a way as not to be detected. (7) We must educate our fellow-citizens, especially our horticultural friends, to understand fully the fact that bees are decidedly beneficial about their premises, do not puncture any fruits, and not only aid in increasing their fruit crop, but in fact are essential for the production of certain kinds of fruit by cross fertilization. (8.) Let us endeavor to call the attention of every bee-keeper in this State to the importance of joining this Association and aiding us in securing the desiderata named above, and let us educate our political friends concerning the serious troubles that confront us in the presence of destructive bee diseases and legislation that we need in suppressing these, as well as for other purposes.

II. The Education of Merchants or Storekeepers.—(1.) The dealers in food stuffs should be educated to the importance of knowing and saying what is good, and selling only pure articles, which will stimulate and build up trade, rather than poor stuff that will destroy it. (2.) Merchants should understand that pure honey will granulate, especially if kept very cool, and that this granulation is due to no defect in the product. However, it can be overcome by placing the jars containing honey in vessels of water, and heating them gradually and slowly until the honey has all become clear and liquid and then holding them at that temperature for a short time. It will not granulate again soon. (3.) Storekeepers should be taught to keep honey from granulating by preventing it from becoming either very cold or very warm. (4.) They should be taught to push the sale of honey and honey-products and thus to place before the public one of Nature's best food stuffs. (5.) It is important for us to show merchants not only how to sell, but where and how to buy. For this, our own Association is justified in having its representative visit their stores, and we should prepare our honey in the most attractive manner and show merchants how to keep it so. (6.) They should understand the importance of legislation against adulteration and should join in a movement against this serious evil.

III. The Bee-Keeper, or the Producer, should be Considered in this Educational Crusade. (1) He should know how to detect the presence of diseases in his apiaries upon their first occurrence, and how

to eradicate such troubles. (2.) He should know how to improve his stock by keeping careful records of each colony and rooting out the poorer queens and propagating from only the best. (3.) He should know how to keep bees and at the same time avoid difficulties with neighbors. A section of honey occasionally handed over the line fence will be found one of the best remedies for bee stings or laundry soiled by early flight, and will insure privilege of entering other premises to reclaim departed swarms. (4.) He should know where and how to secure his supplies, what to use and how to use it, and he should understand the importance of using uniform and interchangeable parts in the entire apiary. (5.) He should have a system of marketing, the basis of which was expressed by one who said, "I place the best honey on the outside of the shipping case, and then fill all the rest of the space with just the same grade." He should have a regular market and develop this by the excellence of his product, his method of shipping, and especially by having his name and address plainly stamped or printed on each package. He should increase the consumption of honey by using it himself at hotels and public places, showing that he has faith in the virtue of his own product. By calling for honey at hotels and having his friends do the same, he can aid in increasing the demand upon merchants or beekeepers for good honey. (7.) He should co-operate with the U. S. Department of Agriculture, Bureau of Apiculture, take advantage of Prof. Benton's good work, and plant seeds of honey-bearing plants, not only such as may be found in our own State, but also such as are sent to us occasionally for experimental purposes. (8.) He should understand the necessity of union in such an organization as ours, and even though he may keep but a few bees, he should be with us for the good we are trying to do. (9.) He should understand the importance of legislation in behalf of the neglected subject of beekeeping in this State and endeavor to induce his legislators to take such action as will aid to place us upon such safe footing as that held by some of our neighboring states.

IV. Education of Legislation.—The legislators of our State should understand that honey production is an agricultural factor not to be despised in a state which contains twenty-eight thousand beekeepers, maintaining one hundred and sixty-one thousand colonies or hives of bees, and ranking fourth in the union in the number of colonies and fifth in the number of pounds of honey produced. This is without impetus from any source, and the possibilities of our State in this direction are immense. However, our industry is threatened by a serious disease that is killing our bees as a blight and a scourge. We ask legislators not only to aid us in legislating against adulterated honey and other food-stuffs, but also in granting us a State Inspector of Apiaries and a system of inspection, such as has proven so efficient in wiping out this dreaded disease from several other states in the Union. Only by serious and united effort can we hope to succeed.

THE HABITS OF THE BEE AND SOME MISAPPREHENSIONS.

BY EVERETT F. PHILLIPS, PH. D., (*Fellow for Research in Zoology, University of Pennsylvania*).

Of all animals, aside from man himself, there are very few that have been the object of more admiration and interest to men of every age than the common honey bee. The domestic animals have, of course, been the objects of much study, but it is much to be doubted whether they surpass the bee in interest. On account of its value to man as a honey producer, as well as because of its most interesting habits, but few insects are as well known as is the hive bee, *Apis mellifera*.

It may be profitable for us to review together for a short time some of the things that we know about bees, and it has occurred to me that possibly it might be even more profitable to find out what we do not know. There yet remains much to be done along the line of observations on the habits of the bee, and lest we forget that we do not yet know all that is to be known, let us first examine the difficulties in the way of observation and then hastily review our present knowledge in so far as our time will allow.

First of all, let us give credit to the men who in the past have spent their time in observation, for by their labor we of the present are enabled to read in a short time the results of years of work and profit in the practical work of apiculture by their recorded results. He would be an ignorant bee-keeper indeed who would fail to acknowledge his debt of gratitude to the men who have worked on the habits of the bee, for apiculture is founded on their work and would not exist to-day as a science were it not for such workers. The names of Aristotle, Swammerdam, Reaumur, Bonnet, Schirach, Huber and others well known to you, must ever be venerated by bee-keepers for the light these men threw on the activities in the hive. Huber, with his loss of sight, stands out among these as an example of a man who could do work of the greatest value in spite of an affliction which would make most men of little value to mankind at large. Later we come to the names of Dzierzon, the founder of the theory of Parthenogenesis, Von Berlepsch, Von Siebold and Weismann. We must also include Langstroth, Cowan and possibly Cheshire in the list, for they have done much in apiculture. There are many more men whose work has helped, but we cannot enumerate all of them. I regret to say that relatively few Americans have done much toward a scientific study of the bee, but what this nation lacks on that side has been more than made up in practical appliances and methods. The source to which every bee-keeper should go for a knowledge of the habits of the bee is not a book written by any of the men that I have named, nor of any other man, but the one place to study the habits is beside a bee hive. First-hand information, properly obtained, is worth more than any amount of second-hand facts and here, as everywhere, we can profitably follow the advice of the celebrated naturalist Agassiz, "Study Nature, not Books."

The study of the behavior of animals is not easy. I am well aware that many persons think that they could not want an easier task than to study the habits of the bee, but there are difficulties which make such work very trying and unsatisfactory.

In the first place, it is often hard to see just what a bee is doing. Let us take an example what happens when we shake the bees from a frame in front of the hive entrance. In a short time a few bees nearest the entrance turn their heads toward the opening and begin to fan their wings; others soon do the same, and before long almost every bee is fanning as if its very life depended on it. Gradually they begin to move toward the entrance and enter the hive. Every bee-keeper has seen this repeatedly, especially when hiving a swarm, but how many could tell what is going on among the bees. This action has been referred to as the "joyful hum" of the bees as expressive of their pleasure at finding again the hive in which they belong. Others have said that the noise of those nearest the hive is heard by the bees farther away, and they know where the colony is located. Whether bees can hear or not is a question which need not be discussed here, but these conclusions are inaccurate because the observations are incomplete. If you will carefully notice this particular action at the next opportunity you will see that the abdomen is raised to an angle of about forty-five degrees and that the last segment is bent down exposing a light yellow strip between it and the next anterior segment. On this yellow area there appears a glistening drop of some fluid and when the bee begins to fan a very peculiar odor is easily detected even by the human nose. Bees are, as is well known, governed largely by scent and this particular action consists in the fanning back of the odor produced by this liquid. The difficulty in earlier observations was that the whole attitude and action was not observed, and consequently the conclusions were incorrect. It is not so much because this is hard to see, but because the observers were satisfied with a partial observation, that we long remained ignorant of this important habit. We pride ourselves on our ability to see things, yet any person who has investigated the subject knows how difficult it is to get two people to tell the same story concerning any observation; and this is not because their eyes do not see alike, but because they perceive only part of the event and let their imaginations fill up the gaps. In no place is this human fault more noticeable than in work on observation of habits, and as a result I feel free to say that this is one of the most difficult problems in the study of animals.

A second difficulty, is that of giving reasons for the things observed. We are not satisfied with mere observations of actions unless we can see why they are performed, for otherwise the action is meaningless. Since the bee is constructed on a plan so totally different from ourselves, we often are unable to interpret the habits and doubtless many important things are still unknown for this reason.

A third difficulty, and one to which too much attention cannot be called, is the difficulty of distinguishing between verifiable and unverifiable truth. As an example, let us take the action of the worker bees towards the queen. The actual observation is this: The workers surround the queen on the comb and touch her with

their antennæ. Whenever she approaches a worker as she moves over the comb the worker turns toward her and at once begins touching her with its antennæ. So much all observers see, but here they separate. One says the workers hold the queen in greatest respect and that they care for her and caress her because they know that on her depends the life of the colony; another observer denies all ability of a worker bee to feel any affection or similar emotion. Now who is right? No one can tell, for at the present time this is unverifiable. The actual movements are verifiable by any observer, but when we try to explain the inner feelings of an insect we enter the realm of unverifiable truth, where our imaginations are our only guides, and consequently our results are worse than worthless. This is the rock on which many observers of bees are shipwrecked. If only there were some way to eradicate the unverifiable statements from the books on bees what a marvelous advance it would be. The very best writers are at fault here and scarcely a bee journal appears that does not contain some such statements.

As another example of this, allow me to quote from one of the more recent works, the author of which may perhaps remain unmentioned.

"The antennæ, in some mysterious way, afford means of communication. By them the bee says all it feels to its friends and relatives.

"Watch two bees meet on a window frame; they instantly cross feelers, and if they come from the same hive there ensues such an outpouring of bee talk, such a tremor of crossed antennæ, such an evident condition of excitement all through their bodies, as might well fill the most practised gossip with envy.

"One can imagine the graphic terms in which they relate the recent awful experience of their capture, how they were suddenly and rudely jerked from a sweet blossom, and after indescribable shaking about in a strange thing made of bands too close together for them to get through and too tough for them to bite through, finally found themselves, as they supposed, free.

"The joy after the fear! but alas, their happiness was of short duration; for when they attempted to return to the clover field visible in the distance, they found themselves suddenly checked in mid-career by what seemed a wall of thickened air, a strange, hard, cold, transparent nightmare of a barrier which they could see through, but could not pass.

"Poor little bees. No wonder their antennæ fly in the discussion of such strange facts, and how fortunate that the ears of the ogre, their captor, are not attuned to the remarks of their antennæ, as they express their opinion concerning him morally, mentally and physically."

Truly this author has wandered far afield in the realm of the unverifiable! I am not one of those who would eliminate all the poetic from our daily life nor would I fetter the imagination as long as it leads to the truth, but to put such an array of obvious fabrication into a book which is intended to instruct us on bees is far from justifiable. It is just this sort of thing which has caused many persons to look with disfavor on much of the so-called "Nature Study" of our schools. It is really a pity that this author did not

discover that there are more wonderful facts concerning the bee which were verifiable than any which were concocted to fill the book.

The three things which I have mentioned are difficulties which even men have who are well trained in observation. It takes much practice before the observations made by any person are of any value, and if we could but prevent people from publishing their results until they really know how to observe what a blessing it would be to apiculture. There are other obstacles which we continually meet, such as the tendency to generalize from one or two observations, and the drawing of wrong conclusions because of bad logic. We may find examples of these later, but there is one other grave fault of which I wish to speak before leaving this subject. I refer to the use of the word "Instinct."

I have no desire at this time to go into a discussion of the causes and nature of Instincts. An instinct may be defined as a natural impulse, leading animals, even prior to all experience, to perform certain actions tending to the welfare of the individual or the perpetuation of the species, apparently without understanding the object at which it may be supposed to aim or without deliberating as to the best methods to employ. There are many actions of the bee which are carried out by newly-hatched bees and for which we can see no cause. The difficulty here is that whenever an observer comes across an action which he cannot understand, and for which he can find no method of formation, he throws it into the general pile of "instincts" without further effort to find a cause. Is it not evident that what we so often call instincts are but actions which we do not understand? I believe, and I am not alone in my belief, that every instinct has a physical cause in the structure of the animal or its environment, and unless we do our utmost to arrive at the ultimate cause of these actions we have not finished our problem. There is a tendency for all men to think that when they have a name for a thing and can use the word fluently that they understand all the details of the question, but we must constantly avoid this. As an example of this, let us take the duties of the bees at different ages. Briefly, they work as follows: For the first day or two the young bees do not work on account of their weak condition, but they soon take up the duties inside the hive, such as wax-building, nursing the developing larvæ, cleaning the hive, etc. Later, generally when about sixteen to nineteen days old, they begin to fly from the hive and ordinarily never do any of the inside work of the hive which they did before. Of course it must be understood that varying conditions may change their actions, but this is what normally happens. Young bees do, of course, fly from the hive in what is called their exercise flight on warm afternoons, but they do not go so far from the hive but that they can be guided back by their sense of smell. Why do they go through this cycle? We can, of course, say that instinct impels them to do all these things, but how much more do we know about it when we have given a name to the impulse unless we look farther?

I have not investigated this problem very much, and do not wish it understood that I think that I have arrived at the ultimate and complete cause of this cycle of action, but certain facts seem to me to indicate that there is an organic cause back of all this. The

large compound eyes, as well as the ocelli of the young bees, are covered with fine hairs, each one of which is much longer than a single unit of the eye. These hairs are not sensory, as Cheshire claims, since they are in no way connected with the nervous system. I can also see no reason why they should be considered as protective since the chitinous lens of the eye is very dense and seemingly needs no protection of this kind. These hairs come off gradually and by the time the bee is ready to fly they are nearly all gone. I do not wish to make the mistake of failing to distinguish between accompanying and casual factors, but I am inclined to the belief that these hairs on the young bees so obscure their vision that they do not fly from the hive to forage because they cannot see clearly enough to do so. As we know, young bees do fly for exercise, but as before mentioned, only so far that they might be guided back by scent.

Whether my view is correct or most erroneous, all must admit that it is no worse than the position of the man who says that it is all due to instinct, for he doesn't know anything about it and I profess to know but little.

That bees as well as other animals do certain things instinctively is too evident to be discussed, but what we now need, above all else, in the study of habits is to recognize the fact that the word "instinct" is too often a confession of ignorance and we must look for other and more fundamental causes where possible.

I have enumerated at some length the difficulties and liabilities of error in a study of the habits of the bee, and if I could but impress on every bee-keeper the fact that these really exist I would be thankful. On the other hand, I know of no more favorable animal for study than the honey bee, and if I spend more time on the difficulties than on the advantages it is because the favorable side is better known.

The work of others in the past makes it possible for us to begin where they left off, and this advantage applies particularly to work on bees, where so much has already been done. The interest which we have in the bee from a commercial standpoint makes the work easier, for a person working on bees is doing something of interest to many people, and but few of us have reached that height of scientific perfection where we do not care for at least some popular interest in our work. Lastly, the numerous modern appliances of apiculture make it possible for us to study bees under many varied conditions, and these changed conditions bring out peculiarities in the habits which would not be seen, except with difficulty, under ordinary conditions. Movable frames, observation hives, mating nuclei, and swarm boxes are of inestimable value in the study of habits.

In discussing the habits of the bee it is hard to know where to begin. Perhaps there is no better way to arrange what is to be said than to follow a colony through a season, taking up the various phases of their activities in the order in which they occur in nature. We can thus avoid unnecessary repetition and still get in all the desired points.

In the spring of the year the colony consists of a queen, whose duties consist in laying the eggs in the cells of the comb, and many workers or undeveloped females. At this time there are no males or drones. During the winter the bees remain quiet, and the queen lays no eggs, so that in the spring there are no developing bees in

the hive. The supply of honey is then also low, for they have eaten their stores all winter and none has been collected and placed in the cells. As soon as the days are warm enough the bees begin to fly from the hive in search of the earliest spring flowers. From these flowers they collect nectar, which is transformed into honey, and pollen, which they carry to the hive on the pollen baskets on the third pair of legs. The nectar is taken into the bee's mouth and then passes to an enlargement of the alimentary canal, known as the honey-stomach, where it is acted upon by certain juices secreted by the bee. On its arrival in the hive the bee places its head in one of the cells of the comb and deposits there the nectar which it has carried in. By this time the nectar has been partially transformed into honey, and the process is completed by the bees by fanning the cells to evaporate the excess of moisture which still remains. When a cell has been filled with the thick honey the workers cover it with a thin sheet of wax, unless it is to be eaten at once. The pollen is also deposited in cells, but is rarely mixed with honey. The little pellets which the bees carry in are packed tightly into cells and if a cell of pollen be dug out of the comb one can usually see the layers made by the different pellets. This collecting of nectar and pollen continues throughout the summer and ceases only with the death of the last flowers in the autumn.

Almost as soon as the honey and pollen begin to come in, the queen of the colony begins to lay eggs in the cells in the center combs. The title of queen has been given to the female bee which normally lays all the eggs of the colony, under the supposition that she governs the colony and directs its activities. This we now know to be an error, but the name still remains. Her one duty in life is that of egg-laying. She is most carefully watched over by the workers, and is constantly surrounded by a circle of attendants who feed her and touch her with their antennae; but she in no way dictates what shall take place in the hive. The eggs are laid in the bottom of the hexagonal cells, being attached by one end to the center of the base. The first eggs laid develop into workers, and are deposited in cells one-fifth of an inch across. As the colony increases in size by the hatching of these workers, and as the stores of honey and pollen increase, the queen begins to lay in larger cells, measuring one-fourth of an inch across, and from the eggs laid in these cells drones develop. The size of the cell does not determine the sex, as will be explained later; but the queen almost invariably lays the worker eggs in the smaller cells and the drone eggs in the larger ones. As these male eggs develop and hatch, drones begin in the colony, generally about the first of May in temperate climates.

The eggs do not develop directly into adult bees, as might be inferred from what has just been said; but after three days there hatches from the egg a small white worm-like larva. For several days the larvae are fed by the workers, and the amount of food consumed is truly remarkable. The larva grows rapidly, until it fills the entire cell in which it lives, and then the workers cover the cell with a cap of wax while the larva inside spins a delicate cocoon under the cap. The worker brood can at once be distinguished from the drone brood by the fact that the workers place a flat cap over worker brood and a high arched cap over drone brood; and this often is of great help to the bee-keeper in enabling him to deter-

mine at once what kind of brood any hive contains. Twenty-one days from the time the egg is laid the young worker-bee emerges from its cell, having gone through some wonderful transformations during the time it was sealed up, this stage being known as the pupa stage. For drones the time is twenty-four days.

About the time the drones begin to appear, the inmates of the hive begin to prepare for swarming, which to any one watching the habits of bees, is one of the most interesting things that takes place in the colony.

The workers now begin to make queen-cells. In our previous description of the development of the young from the egg, nothing was said about the queen, and there are some decided differences in her growth which we will now take up.

As was stated earlier, the queen and the workers are all females. Schirach, an old authority on bees, discovered that the bees can take a young worker larva soon after it hatches from the egg, and, by giving it special food, royal jelly, all during its larval life, and, by constructing for it a special cell, make of the otherwise worker larva a fully developed queen. This it is that the workers of a colony do when they are preparing to swarm. Several young worker larvae are chosen as the material for queen-rearing, generally located near the margin of the comb. The workers now begin to feed these chosen larvae an extra amount of food, and at the same time the sides of the cells containing them are remodeled and enlarged by the destruction of surrounding cells. The queen (or royal) cell is nearly horizontal at the top, like the other cells of the comb, and projects beyond them; later the workers construct another portion of the cell into which the queen larva moves. This is an acorn-shaped cell placed vertically on the comb, about as large as three ordinary cells. As the cell is being built the queen larva continues to grow until the time comes for her to be sealed up and enter the pupa state. Although it takes the worker twenty-one days to complete its development, the queen passes through all the stages and reaches a considerably larger size in but sixteen days.

Before leaving the subject of the raising of queens, it might be well to state that if, for some reason, a queen is killed in the hive, or by chance gets lost, the workers can at any time replace her by the same method, provided, of course, they have worker larvae on which to work. In the same way they will replace or supersede an old queen when she begins to show signs of decreased power of egg-laying, so that this peculiar performance is not characteristic of swarming only.

In the swarming season, at about the time the new queens are ready to leave their cells, the old queen leaves the hive and takes with her a part of the workers, this being known as "swarming." This generally takes place in the morning of a warm pleasant day. It may as well be confessed that we know very little about this remarkable instinct of the bee. In the first place, under ordinary conditions, the old queen would not allow queen-cells to be constructed in her colony, nor has any one told us why she allows it now. Neither do we know what starts the actual swarming, nor which bees, workers or queen, first set the hive in motion. We are equally ignorant of what is the thing which compels certain bees to leave with the old queen and why the others stay in the old hive

with the young queen. Since the prevention or control of swarming is such an important problem in practical apiculture, the value of research along this line is evident. Since our original hive has now divided, let us follow the swarm with the old queen and later return to the old hive to observe the actions of that.

In the hands of a bee-keeper the departing swarm may be put into another hive, provided he wishes to increase the number of his colonies; but in nature the swarm will find an old hollow tree or some similar place in which to establish itself. The bees, before leaving their old hive, fill themselves with honey until the abdomen is greatly distended, and for this reason it is not necessary for them to collect nectar for a day or two; for they have other work to do. Some of the bees begin to clean up the new quarters and get it fit for occupancy; but most of them begin the construction of new combs. To do this they suspend themselves in curtains from the top of the hive, and remain motionless for some time. The wax used in building comb is secreted by the workers in eight small pockets on the lower side of the abdomen while they thus hang in curtains. Finally, after considerable wax has been thus formed, they begin to build. The small flakes of wax are passed forward to the mouth, there mixed with a salivary secretion to make them pliable, and then are placed against the top of the hive. Other workers then come and place their small contributions of wax on those first deposited, and this continues until the combs are finished. There is more to comb-building than the mere sticking on of wax plates, however; and nothing in all bee habits is more wonderful than the beautiful plan on which they build the comb. The cells are hexagonal in shape, so that each cell in the center of the comb is surrounded by six others; nor is this the only remarkable thing in their architecture, for each comb is composed of a double row of cells, the base of each cell being formed of three parts, each one of which is likewise a part of a separate cell on the other side of the comb. By this method the bees obtain the greatest possible capacity for their cells with the least expenditure of wax. The accuracy of the cells of the comb has in all ages been an object of admiration of naturalists and bee-keepers; and while the degree of perfection assigned to these cells has undoubtedly been over-stated by most writers, yet we can not but admire and wonder at the remarkable instinct, almost bordering on intelligence, which enables the bees to build cells so well suited to their purpose.

As soon as there are some cells constructed, and even before they are entirely completed, the queen begins to lay eggs, and the workers begin to collect stores of honey and pollen. They also collect in considerable quantity a wax-like substance from various trees, commonly called propolis, with which the inside of the hive is made tight, closing up all openings except the one which serves as an entrance. In this way the new swarm prepares for itself an abode like the one it left; and by sealing up the crevices and gathering stores it prepares for the coming winter.

We may now return to the colony which remained after the swarming took place to see what happens there. The colony left in the old hive retains all the brood and honey stores, and has a newly hatched queen. There is then no necessity for wax building nor for sealing up the hive; but this colony is already in a normal condi-

tion except that the queen is not yet ready to perform her duties, and she will receive our attention now. A very young queen receives little attention from the workers, but goes about the combs practically unattended. When about five days old (the exact time depending on the weather), in the afternoon, the virgin queen flies from the hive to mate with a drone. She first takes several short, preparatory flights to get her hive located so that she may find it on her return, and finally she flies upward in constantly enlarging circles, high in the air. Thus far she may be easily followed; but few have been fortunate enough to observe the actual mating. Sometimes the mating takes place at a lower point, and a few men have recorded the fact of witnessing the completion of the mating flight. The queen, on leaving the hive, in some way attracts a great many drones to her from all parts of the apiary, provided her hive is located in a bee-yard, and the swiftest and strongest is successful in the race. The other drones often follow the queen back to her hive, and for an hour or two remain on the outside of the hive after she has entered, but later they return to their former hives.

The queen returns from the mating-flight in about half an hour, carrying with her the generative organs of the male, which is killed during the union of the two. Near the posterior end of the queen is a small sac, which, before the flight, is filled with a clear liquid, but after her return this sac is filled with an opaque fluid; and it is the reception of this opaque substance which is the essential thing in mating. This liquid contains millions of spermatozoa, or male sex cells, each one of which is capable of fertilizing an egg as it glides past the opening of the sac. This supply of spermatozoa is almost always sufficient to supply the eggs laid by a queen for three or four years—it rarely happening that she mates a second time before laying. Since a queen can, during her lifetime, lay a total of 500,000 eggs, most of which receive one of these spermatozoa, it will be seen that the apparatus for preserving them is very perfect, since the queen cannot generate more, and they do not divide or increase in number in any way.

The mating of queen and drone never occurs in the hive, but always in the air, on the wing. This fact prevents what is known as in-and-in-breeding; for, if the queen mated in her hive she would receive spermatozoa from her brothers, and we know that such close breeding is undesirable in all forms of life. The cause of the undesirable results of in-breeding are yet a mystery; but we do know that they follow, and this habit of the queen of mating outside the hive renders close crossing less probable. After the queen has returned to her hive, the workers remove the male organs. These parts of the male are not absorbed by the queen, as is sometimes claimed; but the spermatozoa contained in them are taken into the spermatheca and the rest dries up and is removed. Almost as soon as the queen returns from her flight there is a difference in the treatment which she receives from the workers. It happens at times that she is not received kindly after taking her flight, and may be killed by the workers, which do not recognize her as their queen, probably on account of some new odor which she has acquired during her absence. This is rare, however, for ordinarily she is the object of much attention on her return. From this time on, whenever she stops for a moment on the comb, either to deposit

an egg or to rest, she is surrounded by the workers. In about two days after mating the young queen begins to lay, and this one duty she performs until her death, never again leaving the hive except with a swarm.

The colony with the young queen is now in the same condition as the one which left the hive, both having laying queens, combs, brood, and a sealed hive. Their histories, under normal circumstances, are then practically the same. Both prepare for winter, and the following spring both cast swarms again, and so the cycle is repeated. Such is the activity of bees under favorable conditions; but, needless to say, this ideal is not always realized, and we will now follow colonies under other conditions.

Let us take a colony with a virgin queen like the one left after a swarm is cast. It sometimes happens that the queen is defective in some way so that she can not fly from her hive to meet a drone. This may be caused by mutilated or weak wings, or possibly the queen shows no disposition to fly. On the other hand, the weather may not be favorable for her flight, or there may be no drones in the air when she does fly. Evidently, any of these conditions will prevent mating; and when this occurs we are enabled to see one of the most remarkable phenomena of the hive. The observer who wishes to study this phase of bee activity may bring about the same conditions by cutting off the wings of the queen or by covering the entrance of the hive with perforated zinc so that it is not necessary to depend on chance to bring about what we are now to observe.

If a queen remains unmated for a period of three weeks she is incapable of mating, and loses all desire to leave the hive to meet a drone. After that time she may begin to lay eggs, but, strangely enough, these eggs produce nothing but drones and the queen is then what is known as a "drone layer." Obviously then, drones are produced from eggs which have not been fertilized. Not all unmated queens become drone layers; in fact, many queens die if not mated and many others never lay at all; but if any eggs are laid they produce only drones. From my own experience in trying to bring about this condition I can say that the person wishing to verify the statements made concerning this strange phenomenon should start several virgin queens in hives and possibly one or two will lay.

This introduces us to one of the most remarkable phenomena which is known to occur in nature, but it is not characteristic of bees alone. In the vast majority of cases in the animal kingdom eggs disintegrate unless fertilized by spermatozoa of the same species. Just why fertilization is necessary is still a disputed point among scientists; but we know that it is necessary in most cases. To the development of eggs without the usual fertilization the name "Parthenogenesis" is applied.

The parthenogenetic development of drones was first completely described by Johannes Dzierzon, a priest of Karlsmarkt, Germany, and a bee-keeper of long experience. It has since been verified by many workers on the subject. As the eggs pass down the oviduct on their way from the ovaries of the queen they pass the opening of the spermatheca, and if the egg is to become a female it receives from this spermatheca one, and only one, spermatozoon; if it is to become a drone it receives no spermatozoon, and consequently re-

mains unfertilized, as do all the eggs of a drone layer. A normally mated queen rarely lays a drone egg in a worker cell, or vice versa. provided both kinds of cells are present, and consequently we are forced to the conclusion, as much as we dislike to admit it, that the queen in some way can control the laying of eggs of different sex, but how this is done is a mystery. I say we dislike to admit this because it is entirely beyond our comprehension and as stated in the earlier part of this talk, one of the difficulties in recording observation is the giving of reasons for things observed.

Another fact which supports the theory of parthenogenesis is that workers in a colony which is hopelessly queenless will often begin to lay eggs. As we have said, workers as well as queens are females, but they are incapable of mating, and the eggs laid by them produce nothing but drones.

This statement of the theory of parthenogenesis or the "Theory of Dzierzon," as it is commonly called, differs from the usual statements of the theory that find place in the books on apiculture. The Theory of Dzierzon can be divided into two parts. (1) Drone eggs are unfertilized while female eggs are fertilized. To this part all observations lead us to subscribe. (2) All the eggs in the ovary of the queen are male eggs and the fertilization of the egg changes its sex and it becomes female.

The latter portion of the theory is not founded on actual observation but on logic only, and not on sound logic either. Let us state the theory in a different manner. Male eggs are unfertilized and female eggs are fertilized. As far as we can see this is the only difference between them, and since we can see no other difference this must be the thing which changes the sex. Is it not clear that the conclusion does not necessarily follow, for is it not possible that there is some difference between these eggs not yet observed, which is the all-determining factor, rather than that fertilization is?

Fertilization may have nothing to do with sex-determination: (1) Nowhere else is the animal kingdom, except in animals exhibiting parthenogenesis, is it claimed that fertilization has any influence on sex. (2) The ants, which were formerly considered to be similar to the bee in their parthenogenesis, sometimes, according to some recent work, have females produced from unfertilized eggs. (3) In the vast majority of cases where the problem of sex has been investigated there is strong evidence that the sex of the offspring is determined before the egg leaves the ovary. (4) Certain observations made during the past two summers tend to show that there is some other difference between male and female eggs.

In studying the problem of parthenogenesis I was struck by the illogical conclusion concerning sex, and to test the theory spent some considerable time in observations on the subject. I found that many of the eggs laid by a drone-laying queen never develop at all. According to the theory as propounded by Dzierzon and his followers, all the eggs in the ovary are male and if they are unfertilized all should develop and become drones. But all do not develop. I have observed drone-laying queens in one-frame observation hives, and in eight-frame hives, and in all my observations there were always a considerable number of eggs which dried up and did not develop. Of course, all that did develop became drones.

From these facts it is possible that the sex may be determined in the ovaries before fertilization. Male eggs do not require fertilization, and therefore can develop when laid by a drone-layer, but the female eggs of a drone-layer require fertilization, and since they do not get it they die. I am as yet unable to give an exact ratio between the number of eggs which develop and those that do not, owing to difficulties in observation, but of the fact that some do not develop I am sure.

Of course, it will be recognized that this is but a theory with a somewhat small basis of fact, but the facts observed seem to me to be enough to throw doubt on the second part of the Dzierzon theory—that sex depends on fertilization. For fear of being misunderstood, let me repeat that my observations confirm the view that drone eggs are unfertilized, so that the first part of the Dzierzon theory remains unchallenged, as far as I am concerned. The entire subject of the parthenogenetic development of the drones is still but little understood. A few facts are well known, but around these facts there has been woven a mass of good and bad guesses which must be cleared up. If the theory could be stripped of these surmises, the whole subject would be much clearer; and one who undertakes to work on this line must drop all but well-verified facts.

There is one other line of work on bees in which I have been interested for some time and on which there is yet considerable work to be done. According to the views of the majority of zoologists, the variation of animals is the result of crossing of two lines of heredity. In other words, worker bees would tend to vary all the way between their two parents while drones would tend to be like their single parent. This is certainly logical, but by this time we know that it is not possible to figure out in advance what animals are going to do. To test this I have measured something over a thousand each of drones and workers. In this work I chose certain characters on the wings, for reasons which need not be discussed here. Briefly my results are as follows: Drones vary considerably more than workers, rather than less, as we would logically conclude; and furthermore, this variation depends more on the environment under which they are raised than on any inherited tendency. Some as yet unpublished measurements confirm this view most strongly.

I have mentioned but relatively few of the habits of the bee, and if I seem to have taken the view that our present knowledge is meager I hope you will overlook it if you think me pessimistic. The study of the habits of the bee are of the utmost importance to apiculture and since so much remains undetermined, let us hope that many will be enough interested to take up the work. My acquaintance among bee-keepers is not as wide as I would wish, but let me say that the best and most successful that I know are the ones who most carefully study their bees. On this account I urge the necessity for still more work on the habits.

I have carefully avoided a discussion of modern appliances in bee-keeping, and especially cut very short any mention of queen-rearing, since this subject will be ably discussed to-morrow by a man who knows that subject better than I do. It is not because I undervalue the practical side of bee-keeping that I have confined

my remarks to more theoretical matters, but because I fear that most apiarists rather undervalue the so-called theoretical work concerning the bee. I hold that one depends on the other, and neither one alone will ever be a full success. This is my justification in giving expression to the views and facts here spoken.

FOUL BROOD AND OTHER DISEASES OF BEES.

BY HON. N. E. FRANCE, *Wisconsin State Inspector of Apiaries, Platteville, Wis.*

Foul Brood—*Bacillus alvei*, is a fatal and contagious disease among bees, dreaded most of all by beekeepers. The germs of disease are either given to the young larval bee in its food when it hatches from the egg of the queen bee, or it may be by contagion from a diseased colony, or if the queen deposits eggs, or the worker bees store honey or pollen in such combs. If in any one of the above cases, the disease will soon appear, and as the germs increase with great rapidity, going from one little cell to another, colony to colony of bees, and then to all the neighboring apiaries, thus soon leaving whole apiaries with only diseased combs to inoculate others. The island of Syria in three years lost all of its great apiaries from Foul Brood. Dzierzon in 1868 lost his entire apiary of 500 colonies. Cowan, the editor of the *British Bee Journal*, recently wrote: "The only visible hindrance to the rapid expansion of the bee industry is the prevalence of Foul Brood, which is so rapidly spreading over the country as to make beekeeping a hazardous occupation." Canada's Foul Brood inspector, in 1890 to 1892, reported 2,395 cases, and in a later report for 1893 to 1898, that 40 per cent. of the colonies inspected were diseased.

In Wisconsin I know of several quite large piles of empty hives, where all the bees have died from Foul Brood; also many other apiaries where said disease had gotten strong foothold. By the kindness of the Wisconsin bee-keepers, in most cases, I have, during the last eight years, gotten several counties free from disease, and at the present writing, May 27, 1905, have the disease under control. Foul Brood is often imported into Wisconsin, so we must expect new cases until all States have such laws as will prevent it. Arizona, New York, California, Nebraska, Kansas, Colorado, Utah, Ohio and Texas have County Inspectors. Wisconsin, Illinois and Michigan have State Inspectors. Copy of Wisconsin laws are now pending in legislatures of Pennsylvania, New Jersey, Maine, Minnesota, South Dakota, Idaho and Washington.

CAUSES OF FOUL BROOD.

Causes of Foul Brood.—1. Not from chilled, pickled, starved, or any form of dead brood. But such conditions are most favorable for growth of disease. Foul Brood germs do not float in the air. If they did, why would not every brood cell in an infected hive become diseased?

2. Bees sold, having disease, and new locations thus inoculated.
3. Combs, or implements from one apiary used by others in their apiaries.
4. Robber bees, getting honey from infected combs,—greatest danger.
5. Buying queen bees from infected apiaries. To be perfectly safe in this deal, on arrival of queen, place her alone in a clean queen cage with plenty of good honey. Introduce her in this last cage, and burn the just received cage and attendant bees, and no evil results, even from such queens out of infected hives.

EXPERIMENTS.

Experiments.—1. A Wisconsin bee-keeper had foul brood among his bees so bad that he lost 200 colonies with it before cured. Having an extractor, wax press, etc., at home, he placed the bees in boxes while he boiled the hives, extracted the honey from all the combs and boiled the honey, also all combs making beeswax into comb foundation. He then placed the bees in their same hives on foundation made from infected combs, and fed the infected **BOILED** honey. Ten years has passed and no signs of disease there since.

(2). Comb foundation made by supply dealers is perfectly free from any danger of disease. To prove this I took a quantity of badly infected combs, rendered the wax myself, and had two of the extensive manufacturers of comb foundation make into foundation this lot of wax. Then selected twenty of the best apiaries in Wisconsin, where no disease ever was known, and in sixty-two colonies placed this foundation. Five years have passed and no signs of disease in any of those hives.

(3). Honey or wax from a sun-heat extractor, is not safe to use until same is boiled.

SYMPTOMS OF FOUL BROOD.

(1). Brood in combs badly scattered, many empty cells, (See Plate I), cappings dark and sunken, some with holes in cappings, part of the brood hatching while others are dead. The dead larvæ of a dark brown color, or blackish according to age. The lightest colored will, upon inserting a tooth pick, draw out much like rubber or glue, and at that stage has most odor, much like stale glue when warm.

(2). Dried Scales.—If the disease has reached advanced stages, all of above conditions will be easily seen. According to its age of development there will be either the shapeless mass of dark brown matter on the lower side wall of the cell, or the dried scale. This scale nearly black and dried hard to wall of comb as thin as side wall of the cell. The head of the bee often dies in a small bunch and turned up some. In size, about half size of pin head.

HOW TO DETECT FOUL BROOD.

Take out carefully the oldest hatching brood in the hive, and first see if the cappings are smooth or sunken and scattered, with some having small holes in the cappings. This is more noticeable in old black combs. Now bring the brood comb right side up to the level of your chin, tip the top of the comb towards you so your view strikes the lower walls of brood cells about one-third distance

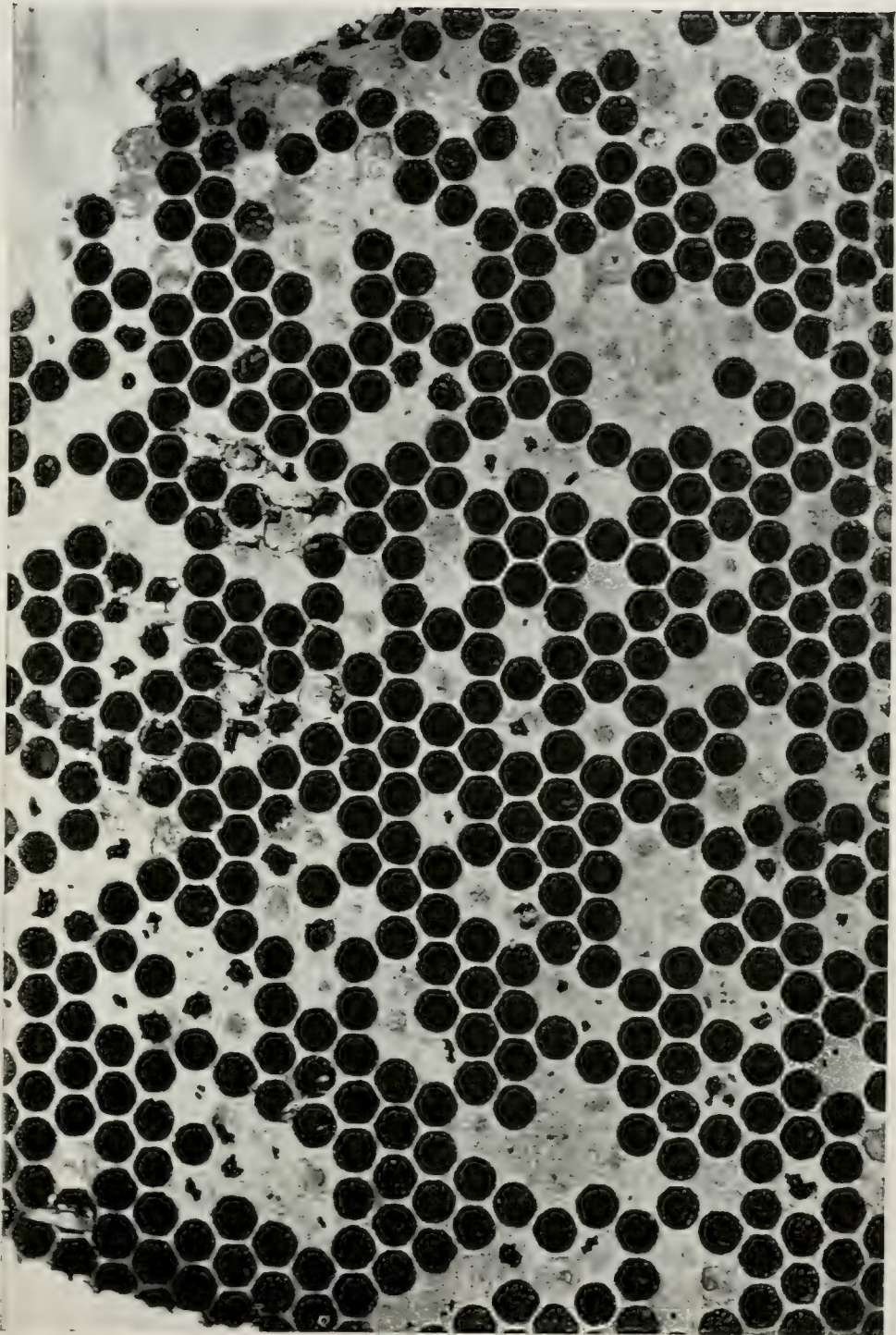


PLATE I.—Comb with Foul Brood. By N. E. France, Platteville, Wis. Loaned by Mr. W. Z. Hutchinson, Flint, Mich., Editor of *Advanced Bee Culture*, in which it was originally published.



PLATE II.—Detecting Foul Brood. By N. E. France, Plattville, Wis. Loaned by Mr. W. Z. Hutchinson, Flint, Mich., Editor of *Advanced Bee Culture*, in which it was originally published. The white line shows the proper angle for the rays of light to fall.

from front. Next turn your body so that bright daylight comes over your shoulder and shines in each cell where your view of suspected disease is found, (See Plate II). The white line in this picture shows the angle I want the light to come in each brood cell. Gas or electric light will not take the place of sunshine or strong daylight.

On the lower side wall, just back from front end of the cells, will be seen the apparently dead foul brood, nearly black, with a sharp pointed head slightly turned up. The body portion of the bee flattened to a mere black lining of its cell, no thicker than one side wall of the comb cells. The other side walls and bottom of the cell look clean. The scales, if present as described, are a sure proof of foul brood. Such infected combs must be burned or melted in boiling water, thus killing all disease and saving the wax. Diseased combs melted by sunshine heat will not kill all disease. I always use abundance of boiling water in saving wax from old combs. I first melt the combs in a large kettle of boiling water, and when all melted and well stirred, is then strained through the wax press, thus saving everything of any value.

TREATMENT.

McEvoy Treatment.—In the honey season when the bees are gathering honey freely, remove the combs in the evening and shake the bees into their own hives; give them frames with comb foundation starters and let them build combs for four days. The bees will make the starters into comb during the four days and store the diseased honey in them which they took with them from the old comb. Then in the evening of the fourth day take out the new combs and give them comb foundation (full sheets) to work out, and then the cure will be complete. By this method of treatment all the diseased honey is removed from the bees before the full sheets of foundation are worked out. All the old Foul Brood combs must be burned or carefully made into wax after they are removed from the hives, and all the new combs made out of the starters during the four days must be burned or made into wax, on account of the diseased honey that would be stored in them. All the curing or treating of diseased colonies should be done in the evening, so as not to have any robbing done, or cause any of the bees from the diseased colonies to mix and go with the bees of healthy colonies. By doing all the work in the evening it gives the bees a chance to settle down nicely before morning, and then there is no confusion or trouble.

TO PREVENT SWARMING OUT WHEN TREATED.

This same method of curing colonies of Foul Brood can be carried on at any time from May to October, when the bees are not getting any honey, by feeding plenty of sugar syrup in the evenings to take the place of the honey flow. It will start the bees robbing and spread the disease, to work with Foul Brood colonies in warm days when the bees are not gathering honey, and for that reason all work must be done in the evening when no bees are flying.

When the diseased colonies are weak in bees, put the bees two, three, or four colonies together, so as to get a good sized swarm to start the cure with, as it does not pay to spend time fussing with little weak colonies. When the bees are not gathering honey, any

apiary can be cured of Foul Brood by removing the diseased combs in the evening and giving the bees, frames with comb foundation starters on. Then also in the evening feed the bees plenty of sugar syrup and they will draw out the foundation and store the diseased honey which they took with them from the old combs; on the fourth evening remove the new combs made out of the starters and give the bees full sheets of comb foundation and feed plenty of sugar syrup each evening until every colony is in first-class order. Make the syrup out of granulated sugar, putting one pound of water to every pound of sugar, and bring it to a boil. As previously stated, old combs must be burned or made into wax and so must all new combs made during the four days. No colony is cured of Foul Brood by the use of any drug.

All the difference from the McEvoy treatment that I practice,—I dig a deep pit on level ground near the diseased apiary and after getting a fire in the pit such diseased combs, frames, etc., as are to be burned are burned in this pit in the evening and then the fresh earth from the pit returned to cover all from sight. Often I use some kerosene oil, a little at a time being poured on old brood combs or those having much honey in, as they are hard to burn. If diseased combs with honey in are burned on the surface of the soil there is great danger; the honey when heated a little will run like water on the soil and in the morning the robber bees will be busy taking home the diseased honey that was not heated enough to kill germs of Foul Brood.

I also cage the queen while the bees are on the five or six strips of foundation. It helps to keep the colony from deserting the hive and going to other colonies.

I do not believe in, or practice burning any property such as hives, bees, beeswax, or honey that can be safely treated and saved. Many times it is poor economy to save all, and as so many beekeepers are not so situated as to keep all diseased material from robber bees while taking care of it, I take charge of the treatment, using my wax press to save all the beeswax that would have been wasted.

BEE-KEEPING AS A BUSINESS.

BY O. C. FULLER, *Chillisquaque Apiaries, Turbotville, Pa.*

The subject of bee-culture as a sole business has been discussed pro and con in the bee papers and bee-keepers' text books until it is about exhausted. Yet how many bee-keepers are making the culture of bees their sole business in the fullest sense of the term? I think they could be counted on the fingers of one hand. But in taking up this subject we must consider it in the sense we understand it in the language of the bee-keeper. Literally speaking, it would mean that the bee-keepers do nothing but keep bees for a livelihood. As that condition hardly exists we shall have to consider the subject in a little different light,—as one's principal occupation or specialty.

As bee-keeping is naturally a rural pursuit, it follows that the great majority of bee-keepers own or live on small pieces of land, which they cultivate to some extent as an adjunct to their regular business of keeping bees, and the income from this source must of course be reckoned as a part of the proceeds of the business. The bee-keeper may perhaps keep a horse, a cow, a few hens, and several hogs, the proceeds from which very materially adds to his income, and yet not destroy his just title of specialist. We cannot truthfully say that the farmer is any less a farmer or that he does not pursue the business of farming, because he does some odd jobs for a neighbor with his team or some work in a different line in the winter months when there is a slack time on the farm. Therefore we shall have to consider bee-keeping as a business on these same lines. I, however, agree with Mr. Hutchinson, in his paper read at the St. Louis convention, that general farming or any other occupation that takes up the greater part of one's time, will not work with bee-keeping, and is therefore not admissible as an adjunct to the successful cultivation of the honey-bee. Yet we cannot ignore the fact that a large proportion of the bees in Pennsylvania are kept upon the farms. It is advisable that farmers keep a few bees to fertilize the blossoms of the field, orchard and garden. The bees thus kept generally supply the farmer's table with honey, and he often has some to sell besides, although the amount is not equal to that taken by the specialist, and is almost always inferior in appearance, due generally to neglect and failure to give the proper attention to the bees when storing. But with all this neglect, almost allowing the bees to shift for themselves, we frequently hear farmers say that their bees are the most profitable thing on the farm. If bees are profitable when kept on the farm, as a side issue, then they must be very profitable when kept without another hampering occupation in the way.

I venture the assertion, without the risk of contradiction, that there is no other rural pursuit that will bring the returns in ready cash that bee-keeping will, taking into account the capital invested and labor involved.

Bee-keeping has always been considered by some as an uncertain and risky business, due to the fact that flowers fail to yield nectar in some seasons, and to the heavy winter losses which have frequently taken place. To the first, I would say that we do sometimes have poor seasons when bees do not gather a surplus of honey for their keepers, but those seasons come only occasionally and the profit secured from the bees in the good seasons ought and will carry the bee-keeper over the poor ones. In speaking of the winter losses, I would say that they are not so great now as they were in former years, due largely to the fact that bee-keepers are learning more about the wintering problem. By giving proper protection during winter (other conditions being equal), there need be no great fear on that score, if the bee-keeper thoroughly understands his business. I, therefore, believe that the investment of capital in the bee business is attended with no greater risk of loss than if invested in any other legitimate business venture.

If we have once decided to make bee-keeping our business, and have any hampering prefixes or suffixes coupled with it, we must begin at once to amputate at both ends if we expect to have a full

measure of success. There are critical times in every apiary when the apiarist cannot possibly be bothered with any other work and must put in full time with his bees.

A successful bee-keeper can never afford to procrastinate, for procrastination is the thief of honey and money to the apiarist. If we put off for a single day the giving of more surplus room to the bees, when needed, it means the loss of many dollars, in a large apiary.

We will now look about us and see what conditions are necessary to the successful prosecution of the business. First and the most important factor in my opinion is location. Fortunately, our old State of Pennsylvania is very lavish in giving us a great variety of honey-producing flora, and I do not think there is a single locality in the State that would not support from ten to one hundred colonies of bees. In looking about for a good location for our apiaries, we should take the lay of the ground and the abundance of honey-bearing flowers into careful consideration. The character of the soil should also be studied. If I were to choose the ground for an apiary, I should try to get a piece of ground that is dry, and which would never become wet nor flooded. It should slope gently to the south or southeast, with a hill or an elevation on the north and west of the Apiary to protect it from heavy wind storms and cold blasts, especially if the bees be wintered on their summer stands. A brook or small stream of water close to the apiary is also very desirable, as the bees will not thus have to go far from their hives for water. Many bees are lost in the early spring by being compelled to go too great a distance for their supply of water. The cold chilling winds of this season are fatal to bees.

Having found a place like this with plenty of honey-yielding flowers within easy reach, we have an ideal location.

We must now study the flowers and find out when they bloom, and when we may expect a yield of honey or pollen from them, so that we may be ready for the honey flow when it comes and then we should manage our bees accordingly. As the honey flora is essentially uniform throughout the State, the management of the bees is practically the same. In this connection I might mention the most important honey and pollen yielding plants of our State. By the time spring has fairly begun, the tag alders and the willows blossom and the bees revel in their pollen, the first of the season. (Brood-rearing now begins in full blast.) This is followed by the opening of the soft maples, with their bounteous supply of both honey and pollen. Dandelions, sugar maples, fruit trees and dogwood, follow in close succession. A short intermission now takes place, then the raspberries come into bloom, followed closely by the clovers with their feast for the bees. Before the clovers cease to yield, buckwheat is beginning to give out its fragrance, and next the season closes with a sea of goldenrod and asters.

This is a list of the most important honey plants in my location, and I give it as a hint to the prospective specialist. It is what I consider a fairly good location for the bee-keeping business. This is by no means a full list of the honey and pollen bearing trees and plants that are visited by bees. There are many others of minor importance. I have omitted the Linden or Basswood tree, because very little of it grows in my locality, but it is one of our most pro-

fuse honey-yielders in parts of our State where it has not yet been cut down and destroyed by lumbermen.

If the prospective specialist has found a place like I have described, he need have no fear of the results, providing, however, he does his part well. But it should be remembered, however, that in a large apiary it requires a considerable area of a certain honey plant to produce surplus honey in paying quantities. In this connection we might examine the character of the soil. I do not wish to be regarded as out of the ordinary, but by close observation I have found that the character of the soil has nearly as much influence on the flow of honey as the state of the weather, notwithstanding the frequent assertion by good authority that climatic conditions control the flow of honey. Take, for example, white clover. I have found that on calcareous and clay loam soils it yields much better than on gravelly soils, and under conditions when on gravelly soils it does not yield at all. The same is true of sandy loam underlaid with limestone. It would, therefore, be well for the bee-keeper to take the character of the soil into consideration when selecting a location for his apiary.

The next important factor is the kind of bees. Much has been said about a general-purpose bee, but as that race of bees does not exist we shall have to confine our selection to the varieties that we have at present. I have tried several of the different strains, but have settled down to the conclusion that if I were located where clover is the main honey plant I would prefer the pure three-banded Italian. But as I am located in a part of the State where large quantities of buckwheat are grown, and clover is plentiful, I prefer a direct cross of Italians with the black, or German, for the Italians do not work well on buckwheat. By crossing them we have a bee that will work on buckwheat as well as on clover. I do not wish it to be understood that I keep all hybrids; far from it. I always buy and try to raise pure Italian queens. But I keep all queens that mate with black drones, and their colonies nearly always pile up more supers of honey than the pure Italians do. Therefore the selection of the race of bees best adapted to the bee-keeper's location depends somewhat upon the kind of honey plants found in that section.

Much of the bee-keeper's success depends also on the kind of hive used. But I shall omit to mention a choice of hive in the fear of getting on somebody's corns. Suffice it to say that the bee-keeper should use a modern, up-to-date, hive. After a crop of honey has been secured it seems to me that time and money should not be wasted in shipping it away to the large cities to be sold when it could all be disposed of near home by the apiarist himself by working up honey routes. Thus the transportation charges and commission could be saved, another big item to help swell the bee-keeper's pocketbook. Establishing honey routes in a new territory is up-hill work for a time, but you will soon get all the customers that you are able to supply, as your product becomes better and more favorably known. Only a few years will pass until you will have no need to peddle honey, as your customers will send in their orders to your home, or come and get their supply. This is my experience along that line.

I believe that every large bee-keeper should make his own founda-

tion, and by so doing one half the outlay of cash for foundation could be saved. It does seem to me a waste of money to sell our wax for 25c. per pound, and turn around and pay more than double that for foundation. By the possession of foundation mills with a warm room to work in, it could all be made at home during the winter. We would then have nice fresh foundation for the bees to work on, and no time lost by them trying to soften some old hard foundation in the height of a heavy honey flow when time means money. In the disposal of his honey, the manufacture of wax into foundation, getting sections, hives and supers ready for the next season, lies the partial solution of the problem, "What shall the bee-keeper do to occupy his time during the winter?"

As the success or failure of any kind of business depends largely upon the qualifications and general make-up of the individual that undertakes it, so is it in bee-keeping as a business. It does not require a man or woman with greater physical strength than the ordinary man or woman possesses, but it does require a person with strength of character. That is to say that he should have a large amount of push and energy in his make-up, and at the same time have a mild, patient disposition, but be quick to act in an emergency. The bee-keeper should also be of a mechanical turn, as many little things about the apiary (and there are many), could be made by one handy with tools, thus saving the expense of buying.

A person that has a nervous temperament, who is easily excited, and goes about the apiary dodging every bee that may happen to come near him, will never succeed as a bee-keeper,—much less as a specialist. Therefore we can not close our eyes to the fact that many failures are due to the inadaptability of the individual to the business.

With the proper qualifications and a thorough knowledge of the subject, I can not see an excuse for failure.

In a paper like this it is not possible to give more than a few hints and suggestions, along the line of bee-keeping as a speciality, but the most important of these I have tried to enumerate. It should be understood, however, that bee-keeping as a business, does not offer the opportunity to become very wealthy. It does, however, offer the opportunity of an independent life and a good living, with a fair yearly surplus for a rainy day. Fortunately, the perfection of a man's happiness bears but little relation to the size of his fortune, and the bee-keeper, with the hum of the bees over his head, finds happiness deeper and sweeter than ever comes to the merchant prince with his thousands.

THE BEE AND HORTICULTURE.

BY GABRIEL HIESTER, *President, Pennsylvania State Horticultural Association, Harrisburg, Pa.*

From the way your president has stated my subject, I suppose he intended me to discuss it from an economic standpoint, and that is what I shall try to do. I do not know a more interesting subject than the relation of the Bee to Horticulture and the great part it

has taken in the multiplication of varieties of fruits and flowers on the face of the earth. I do not know of any one thing that so forcibly illustrates the great wisdom and foresight of the Creator than this. Let us take an apple blossom, for example, which can be used as a type of all fruit bearing trees and vines. Here we have:

- (1) In the centre a straight pin with soft head;
- (2) 25 slender pins with oblong organs attached to the end;
- (3) A drop of very sweet liquid at the base of the centre pin;
- (4) The Bee with an instinct to gather this sweet liquid;
- (5) The base of his legs and his belly provided with hairs;
- (6) The fact that the Bee does not mix his drinks;
- (7) The dual use of pollen;
- (8) It does not discriminate between varieties.

It has been discovered recently that many trees, bearing apparently perfect blossoms, are not self-fertile, while the blossoms have the proper number of stamens, which furnish an abundance of pollen, this pollen is actually inert when placed on its own pistil, and in order to fertilize the embryonic seed the pollen must be brought from a different variety. The Wild Goose plum is the most pronounced example of this peculiarity. The fact that in some places the Wild Goose plum bore abundant crops and in others was absolutely barren, caused fruit men for a number of years to believe that there were two kinds of Wild Goose plums; but after budding only from bearing trees, and setting out these young trees in orchards, they found the same singularity, and gave up that theory. Quite recently, within the past twenty years, one of the experimentors in the United States Department of Agriculture, at Washington, hit upon the true cause, and now any one can have Wild Goose plums in abundance by planting a few plums of an other variety near them, and the bees will do the rest. Since the discovery in regard to the Wild Goose plum, it has been found that many varieties of pear and some of our best apples are partly self-sterile, and while they are not absolutely barren when planted alone, they yield much better when planted beside some other variety that blooms at the same time. I think it is only within the past ten years that the Bartlett pear has been placed in this list. We have no complete list at this time, but the U. S. Department of Agriculture is experimenting along this line and adding to the list each year. The fact is, it has grown so large that they recommend that in planting orchards no large block of any one kind shall be planted, but that we should plant not more than four or five rows of one variety then a row of something else, and so on, to allow an inter-change of pollen. While a great deal of this pollen is carried by the wind, the most effective work is done by the bees.

Strawberries cannot be forced in greenhouses without the aid of bees, even by the use of perfect-flowering kinds. There is no wind to shake off the pollen, and to have perfect berries it must be thoroughly distributed or each of the numerous seeds will not get its grain, and we will have a mis-shaped berry. By placing a hive of bees in the greenhouse just as fine berries can be grown as out of doors; better, in fact, because we have perfect control of the water supply.

I have already stated that the bee does not mix its drinks, but while it will not mix apple nectar with any other nectar, it does not distinguish between variety, and is just as likely to travel across varieties as to go lengthwise with the row. In this way it has been instrumental in multiplying varieties. The fact is, with all our science and all our skill, we are indebted to the bee for nearly all of our best varieties of fruits. Study the pedigree of almost any highly prized variety, and you finally come to a chance seedling in some out-of-the-way place. How did that chance seedling get there? The bees made a cross between known varieties growing near each other. A bird carried the seed and dropped it where it sprouted, grew, and finally bore fruit. Go through the list, and for every desirable variety that has been produced by the ingenuity of man, you will find one hundred that are the product of the bees.

So we see, when this old world was new the bee began its horticultural work and has kept it up without intermission through all the ages. The service rendered has been of inestimable value to man. It cannot be stated in dollars and cents, and the bee will certainly continue to work industriously along the same lines on every fair day during the proper season while time lasts. I think I am safe in saying that future generations will be indebted to the bee for their best varieties of fruits, just as we are for the best at present, notwithstanding our advance in knowledge of the natural sciences; but of one thing you be sure: The bee will never give you a seedless apple.

Notwithstanding all its good and useful traits, the bee manages to make itself very unpleasant in the orchard at harvest time. This is especially the case with early peaches and plums. These are more inclined to rot than others, and they then prove very attractive to the bees. In picking the fruit, one is very apt to gather a bee in his hand with a peach, and a sting is the result.

They sometimes become very troublesome about the house when canning and preserving is being done. I remember an instance of this kind which occurred a few years ago. A farmer living just across the river from Harrisburg kept a number of bees. One day they scented the preserving kettle on a neighbor's stove and they marshalled their forces and literally drove the family out of doors and kept them out until sundown. A damage suit in court was the result.

On a large fruit farm in Franklin county some years ago, at the time I visited it, they were canning peaches on a rather extensive scale, and the bees from their own hives annoyed the women who were paring peaches so that they could hardly work. Several were badly stung while I was looking at them.

I then and there decided that while I grew fruit for market I would not engage in the bee business.

Note.—The way to prevent such trouble, entirely, is to feed the bees with syrup or dilute honey, best by spraying it on the leaves of trees, when beginning such work.—H. A. S.

The bee has been charged, whether justly or not, with cutting grapes and sucking their juice, thus doing great damage to vineyards. I have never actually caught a bee in the act of cutting

the skin of the grape, but have many times found them sucking the juice from grapes that had the appearance of being freshly cut, and I have never been able to decide what made that peculiar cut, which is always a perfect cross, on the upper side of the grape, if the bee did not do it. Circumstantial evidence is certainly very strongly against it. A bird could not make such a cut with its beak, and nothing else is ever seen sucking the juice except the bees. It would take many pounds of honey each year to repay the loss which I sustain from this source.

It is just because of the few very unpleasant traits last mentioned that I have left the bee severely alone.

Remarks by Prof. Frank Benton, U. S. Apiarist, Washington, D. C.: It is now definitely known that the Yellow Jacket is the insect that cuts or punctures fruit, such as the grapes referred to in the very excellent paper to which we have just listened with such interest, profit and pleasure, and the honey-bee never punctures nor bites fruits of any kind. It can feed on the juices of fruits only when the skin is broken by some other agency. This was proven by putting bunches of grapes, some with punctured berries and others with entire, in the tops of hives of bees. The punctured grapes were sucked dry and those entire were not attacked, even after some of the bees starved. Bees never attack when searching food, and sting only when squeezed, as described above. To avoid such trouble, either work within screens or feed bees at the time.

SWARTHMORE DEMONSTRATION.

Before the Pennsylvania Convention.

In his remarks before the Pennsylvania State Bee-Keepers' Association, at its annual meeting held in Harrisburg, December 6 to 7, E. L. Pratt, of Swarthmore, said:

"I have been asked to prepare a paper on some queen-rearing subject for this convention, and I think I can not do better than to give a brief explanation and demonstration of the queen-rearing appliances we have used in Swarthmore with so much success and satisfaction.

"When I first entered the queen-rearing field the laborious methods employed quite discouraged me. To continue in the business I must needs hire help or devise means to reduce labor. The latter I set out to do, and the things here before you are the results of my efforts."

Both the old and the more recent queen-rearing methods were briefly reviewed and the necessity for a separable and easily removable queen cell was clearly shown. To avoid the delicate surgical operations, he was compelled to perform by old methods (previous to the emerging of the young queens), a wooden cup is now used.

The top application of the "Swarthmore" pressed queen cups was explained and the many labor-saving points of a flange cup were set forth by demonstration.

The process of waxing the cups, pressing the cells and grafting them without royal jelly was gone through with and numerous questions from the floor were answered. The use of the Swarthmore open-top holding-frames and the manner of applying cell-bars, incubating and confining cages to them through slits in the sheets, from the tops of the hives, without disturbance to the bees, was also demonstrated, and the simplicity and labor-saving points of each carefully set out.

The speaker then branched into the wholesale possibilities of the Swarthmore plan, showing how large numbers of queen cells may be secured and cared for.

A number of small cups, set side by side in a little frame, so as to resemble a comb in which the breeding queen will deposit eggs to save the long process of grafting by hand, attracted considerable attention and brought forth much comment and many questions. It was shown how these little cups, each containing an egg, could be drawn from the frame, slipped into holding-shells and given to the bees for queen-rearing, and how other cups could be replaced in the frame for future use in cell getting.

Previous to his explanation of the miniature mating boxes, the speaker quoted from his book, "Baby Nuclei," the following words of introduction:

"It was in 1881 that I first began to experiment with section-box nuclei for mating queens. Some three or four years later the plan I had been commercially successful with was published in the journals of that day and in pamphlet form, under the title of 'Pratt's New System of Nuclei Management.' Never to this day have I to any extent used more than a handful of bees in a little box for the sole purpose of making my queens. My little baby-mating boxes have been condemned by nearly all the professionals, including Mr. Alley, in whose yard I had the pleasure of studying with profit for some three or four seasons. In the face of all this opposition I have clung to my little mating boxes and have improved them from year to year, until we now have what is called the 'Ideal.' Time and time again have I called attention to the woeful waste of bees, labor and material by the older mating methods—but I could get no hearing until a recent year. It so happened that I succeeded in mating a large number of queens from little boxes fitted into frames and hung on stakes, also attached in different ways to the sides of hives. My description of these experiments was admitted in part to 'Gleanings in Bee Culture,' which renewed interest in small mating nuclei, and the question now seems to command wide interest because of the wondrous saving in expense over any other method of queen mating."

In opening the queen-mating question the speaker said that twenty-five bees will mate a queen. Fifty will do it better, but more than a small teacupful is a positive disadvantage. The design of the Swarthmore mating nucleus box was shown, and the manner of hanging them to little T stands driven into the ground together with the manner employed to supply them with small combs and storing

them with honey; also how bees are obtained and supplied in small lots to each little mating box.

While on the question of queen introduction, Mr. Pratt said: "It was Mr. Doolittle who showed us how to successfully introduce virgin queens to confined and broodless bees; Mr. Alley it was who taught us the use of the tobacco pipe for the same purpose, and it is hard for me to decide which is the greater gift. Both are golden.

"The folly of brushing the bees from small mating boxes directly they had mated a single queen is apparent," said the speaker, "when the same bees can be made to mate queen after queen, either by pre-introduction or by giving ripe cells." When the simple manner of giving cells to baby nuclei was demonstrated, applause followed.

After going through the different means employed in quickly feeding the babies with bulb and tube, or by means of little bottles, Mr. Pratt showed the convention how substantial bee hives are made by him from paper at a cost of only a few cents per hive, and of little labor; at the close of which a standing vote of thanks was given to "Swarthmore" for his interesting talk.

At the close of his remarks, Prof. H. A. Surface, M. S., Economic Zoologist in the Pennsylvania State Department of Agriculture, at Harrisburg, and President of the Pennsylvania State Bee-keepers' Association, paid "Swarthmore" a most glowing tribute.

The private secretary of Governor Pennypacker, Mr. Bromley Wharton, said he had come to the meeting for the purpose of conveying the regrets of the Governor, who was unable to attend, owing to pressure of business of State; it had not been his intention to stay more than a few minutes, but the absorbing interest of the topic had held him far beyond the usual leave, and he would certainly report to the Governor what he had heard at this meeting.

—From the *American Bee-Keeper*.

EDUCATION IN APICULTURE.

BY RICHARD D. BARCLAY, *State College, Pa.*

Our President in his address last evening covered most of the points which I had intended to discuss, but perhaps I can add some details upon certain features. The matter of education of the public is of very great importance, but I can add nothing to what has already been said upon this phase of the subject.

The Correspondence Lessons which have been referred to are a part of a system of lessons upon a variety of agricultural subjects which have been prepared and are conducted by the School of Agriculture of the Pennsylvania State College. Information in regard to any of these courses will be gladly furnished, upon request, by Prof. Geo. C. Watson, State College, Pa. The applicant for enrollment is furnished a card upon which he designates the course which he desires to pursue. When his card is returned the first lesson is sent, accompanied with a set of questions. The student is expected to study

the lessons, answer the questions in writing, and return these answers for correction. Unless a satisfactory showing is made in the answers the next lesson will not be supplied. Thus, a question paper is sent with each lesson, and when each set of questions has been properly answered the next lesson is forwarded.

The lessons which I am now preparing are necessarily very brief and incomplete, but the fact that our State Agricultural College conducts a course indicates Bee-keeping is a step in advance. I want to make them as helpful as possible to the student of Apiculture, and ask for free criticism in order that further editions may be corrected and improved.

A few days ago I talked to Prof. Watson, who has charge of the men taking the short course in Agriculture, about giving the short course students some instruction in Bee-keeping. He told me he would try to arrange for a very few lectures on Apiculture, to be given this winter, and that in future years even more time might be given to this work. Thus we have the promise of some direct instruction at the State College at least to the short course men.

At the request of President Atherton, I have handed him some suggestions for a regular course of instruction in Apiculture, extending over two years, and intended to be a part of the proposed course in Horticulture. This course in Horticulture is intended to be primarily for women, and the value of instruction in Bee-keeping in connection with it is very evident. Dr. Atherton said he could not at this time give any information as to the prospect for the inauguration of this work, but he appeared to be hopeful. We have thus started a wedge for extended instruction in this subject to the regular four year students who may elect it.

The fact that there is a correspondence course, the promise of at least some instruction to the short course men, and the interest of the authorities in further work in this line, should cause us to congratulate ourselves upon our progress in our educational campaign during the eight months since our Association was formed.

At the Normal Session of Farmer's Institute Lecturers at Bellefonte last October I made an address upon Bee-keeping which appeared to interest those present in this much neglected branch of Agriculture. Through the kindness of our friend, Mr. E. L. Pratt, I was able to show one of his "Baby Nuclei." The ease with which these bees were handled, and the fact that they clung to the comb while being passed about for examination, were object lessons to those not familiar with improved bees.

Deputy Secretary Martin, who is the Director of Farmer's Institutes, told us at this meeting that he would be pleased to aid us in disseminating knowledge of Apiculture by sending persons qualified to speak regarding bees, to Institutes in every county of the State, if we would and could provide the men fitted for such work. We thus have the State Department of Agriculture back of us in this educational movement. I am scheduled to speak at several institutes this winter, and shall endeavor, with the aid of a model of a movable frame hive and fixtures to illustrate the difference between the methods now most common throughout the country districts and those improved methods with which we are familiar.

If the fear of stings can be overcome by showing the possibility of improved bees, the erroneous ideas regarding swarming and its

attendant excitements dispelled, and a method for controlling swarming either by clipping wings, or shaking bees, or both, be shown, a great step will be made. With constant instruction in Apiculture at Farmers' Institutes we may look for improvement of the methods of Bee-keeping in our rural districts. For the opportunity to effect this advancement we owe our thanks to the Hon. A. L. Martin, and for the origin of the general crusade of Apicultural education in the State College as well as in the State Department of Agriculture, to our efficient and worthy President, Prof. H. A. Surface.

IMPROVEMENT OF HONEY-BEES.

BY FRANK BENTON, (*In Charge of Agriculture, U. S. Department of Agriculture.*)

Before a body of practical men engaged in the cultivation of honey-bees for profit chiefly, without, perhaps excluding the pleasure and interest to be derived from the keeping and handling of these insects, I judge that a presentation of this subject in a manner such as will appeal to the conditions and limitations under which most of us are obliged to work, with specific recommendations as to what may be practically carried out in our own apiaries, will be a much better plan than to present, theoretically and abstractly, any scheme for the improvement of bees through a complicated and perhaps long series of breeding experiments. With this main purpose before me, I ask your consideration of certain conclusions which I have reached after more than forty years' work in the apiary, during over thirty years of which I have been engaged in the rearing of queen bees of various races and crosses between those races. Personal examinations, and, in some instances, several years' experience, in the native lands of nearly all of the races in common cultivation in this country, has assisted me considerably in arriving at conclusions of a definite character, and reasonably satisfactory to myself. Likewise, the experiments that I have made in crossing various types during this period, and particularly during the twenty years past, have led me to some conclusions which I think may be profitably employed in our selection of breeding stock.

The subject naturally divides itself into: First, the selection of a race or breed; second, the selection of individual queens to breed from; third, the methods employed in rearing queens; and, fourth, the selection of drones, or male bees.

SELECTION OF RACE OR BREED.

Caucasians for Beginners.—One of the first points suggesting itself to a person about to begin the cultivation of bees is what race or breed is best, and, while I would not suggest that one having no experience should undertake the work of improving the race or breeds which have been cultivated for so many years by those of long experience and accurate knowledge of bee-life, still, the prac-

tical question arises with the beginner how he can keep to the best type, or at least approach it, while learning how further improvement may be effected. There comes also to his mind, at least in many instances, a dread of cross bees and the fearful stinging which may result from unskillful manipulation of bad-tempered races. Since, however, there exist bees so gentle as to remove all difficulties in this direction, and which are, at the same time, productive workers comparing favorably with most others, there need be no question whatever but that the most advisable thing is for the beginner to adopt one of these races. The gentlest are the Caucasians, imported originally from the Caucasus, a Russian territory lying between the Black and Caspian Seas, partly in Europe and partly in Asia. They have been cultivated to a greater or less degree for some twenty-five years in Europe, and, although imported into the United States a number of years ago, but little has been done in the way of multiplying them and introducing them generally. Their manifest place, however, in popularizing bee-keeping in cities and towns and among the rural population, wherein fear of stings is the chief obstacle to a more or less extended introduction of bee culture, makes the Caucasian race preeminently one which should receive much consideration. In view of this, the United States Department of Agriculture has recently imported quite a number of breeding queens, and plans an extensive introduction and testing of this variety in various portions of the country. The most prominent particular in which they differ from other races is their gentleness. It is quite possible, without the slightest fear of stings, to open the hives at any time during the working season, without the use of smoke and with no protection to face or hands. The bees may be given the roughest possible treatment—shaken, brushed and tumbled about, as though they were so many beans, yet no resentment will be shown. The queens are exceedingly prolific, and the workers industrious. They are, therefore, decidedly to be recommended for all novices in bee manipulation.

Carniolans for Comb Honey.—Should the purpose of the bee raiser be the production of the very highest grade of comb honey Carniolan bees, or bees largely composed of this blood, are to be recommended. The qualities for which they are noted are prolificness, hardiness (both as regards the individual workers and as regards whole colonies). Their industry is marked. Their gentleness, when pure in blood, is acknowledged by all who have had genuine Carniolans. In this respect they are second only to the Caucasians, and, as a race, quite in advance, in gentleness, of the best Italians.

The question might be raised here why I would not recommend, in preference to the Carniolans, the Italians, so long and favorably known in this country. While admitting that many strains of the Italians quite exceed others in productiveness, gentleness, hardiness, and honey-yielding powers, I cannot in these particulars rank them as averaging equal to the Carniolans. Their disposition to cease brood rearing, wholly or in part, at critical times and their great predisposition toward dwindling in early spring oftentimes makes it very uncertain whether their colonies will or will not be in proper shape for the given harvest. On the other hand, the native hardiness, the race prolificness, and the steady brooding qualities of the

Carniolans, enables any one who manipulates them rightly to bring them into any given harvest with a large force of field workers ready to take advantage of that harvest. They are, therefore, to be depended upon, if managed in accordance with their race-peculiarities.

While recommending Carniolans particularly for comb honey, because of the fact that they seal their completed combs in a snowy-white manner, there can be no objection to their employment in the production of extracted honey or in apiaries where both comb and extracted honey are produced. There are, however, some strains or types which, as regards absolute quantity of honey, yield more. I refer to those bees containing a greater or less percentage of eastern blood.

Cyprio-Carniolans for Extracted Honey.—By mating Cyprian queens to Carniolan drones a combination is produced of the prolificness, great energy in honey gathering, and general activity of the best of the eastern races, with the most hardy and prolific of the western races. The noted gentleness of the latter is also largely preserved in the cross. The loss in this combination is seen when we examine critically the solid sections of the honey produced by these workers. The somewhat watery appearance common to work of eastern bees is at once detected, and, although the quality of the honey itself is quite equal to that gathered by any bees, the appearance of the combs for a critical market is somewhat inferior. Except in this respect, and also in that the workers having eastern blood are rather more free in the use of propolis than the bees of Europe, and likewise are not always as easy of manipulation, bees of this cross are to be ranked as decidedly the most valuable and wonderful honey producers thus far cultivated.

Bearing in mind these general hints here presented regarding types, the person proposing to breed the best bees for a given purpose will surely be able to make a suitable selection of a race or breed.

SELECTION OF BREEDING QUEENS.

The greatest possible care should be observed in the selection of the queen-mother, both as regards the queen herself and also the qualities and race-characteristics of her progeny.

The Stock.—In deciding whether a given queen is worthy to be the mother of all, or a great part, of the queens which shall head the honey-producing colonies, a critical examination of the stock itself should be made. Since the prime quality must necessarily be the honey-gathering powers, this will receive the first consideration. In estimating this, it is hardly necessary for a man of experience to test with the scales the actual number of pounds of honey produced. He may judge merely by a careful comparison, during a given honey flow, of the activity and relative amount of honey gathered in his apiary by individual colonies. He can also see, by the general activity and energy displayed by the separate colonies, which are doing the most. Having selected those which in this particular meet his approval, he should choose from these a colony which shows the general race-characteristics of the breed to which it belongs. By this I mean that the colony must possess, in a marked degree, those important and valuable traits which have caused the

selection of this race. Just here perhaps I would differ from some others, in that, instead of recommending the selection in all instances of the particular colony in the apiary which has yielded the most honey I might select one which had given a smaller number of pounds under the same circumstances than many others, but which presented a uniform and well developed type of the race in question, with no marked inferiority in honey production. Having determined upon these two important characteristics, I should consider as coming next, the gentleness of the given colony. Here, invariably, other things being equal, I would select the very gentlest. It should also be borne in mind that this term "gentleness," as here used, is a relative one, for a colony belonging to the Cyprian race could hardly be expected to come up to any such standard in this particular as the Caucasian, Carniolan, nor even the Italian taken all in all. As an illustration of what should be required in this respect, I would state that one of the tests to which I invariably subject a colony of Carniolans whose queen I intend to use as a breeder, is how well they bear manipulation after dark. Of five colonies whose queens and bees might come up to the standard in all other particulars, it will usually be the case that two or three will hardly meet the test of manipulation at night. Standing a lighted lantern or lamp on one corner of the open hive, the frames are lifted, one after the other, with only the use of a small amount of smoke, as would be the case in manipulating during the daytime. The bees must remain appreciably as quiet on the combs as during the daytime, and, above all, must not fly in great numbers toward the light. There are many other tests to which they may be subjected, and this is merely cited as an instance of one direction in which the race-characteristic should be examined.

The Queen.—The queen, likewise, must show, in a preeminent degree, her race-characteristics; that is, she must be prolific for one of her race. This implies, if she be of the Cyprian race, that she is far more prolific than the average, or above the best, Italian queens—more prolific even than the largest and most productive Carniolan. If, on the other hand, she be of the Carniolan race, size, rotundity of form, general robust look and activity are to be considered. While it is expected that she will be more prolific than an Italian queen, yet equal prolificness with any of the eastern races is not counted upon, notwithstanding her extra size. I have never found a queen-bee that was too prolific to suit me. The building up of powerful colonies depends upon this prolificness of the queen, and it hardly needs mentioning here that it is only through having a powerful field force that large yields of honey may be obtained. I must, therefore, rate extra-prolificness in queens as their most valuable trait. Along with this I look for strength of body, limbs, and wings, in fact, a general compact, symmetrical and well-developed form, combined with activity. Such a queen, showing, herself, all of the race-characteristics of the breed to which she belongs and whose workers likewise show race-characteristics of their class, will be very likely to reproduce herself in her queen progeny, and, through the latter, will give colonies which are typical of the race to which they belong.

MANNER OF SECURING CELLS.

If considerable numbers of cells are required, it is always better to have a colony of Carniolan bees, Caucasians, or some one of the eastern races as cell builders, since they produce much greater numbers, even fifty to one hundred cells in a single batch being quite common. Being also excellent nurse bees, the food supplied to the developing larvae is abundant, insuring more perfect development than is the case with the nurse bees of less prolific races. The first step is to make queenless a very populous colony; on the third day thereafter the colony may be put into condition to receive queen cells. There is no need of rejecting many of the cells which may chance to have been formed in this colony, since, if properly managed, they may be made to produce most excellent queens. For convenience, these incipient cells may be cut out and attached with melted wax at regular intervals on a top bar. The larvæ ranging in age from forty to sixty hours are to be removed with a slightly bent toothpick, and, in their place, are to be put, with the same instrument, larvæ from twelve to thirty-six hours of age, taken from the colony of the chosen queen. This substitution of young larvae insures a full amount of food from the very beginning—even a superabundance. In choosing the cells to be placed on the bar, only those having large bases upon which a normal sized cell may be built, should be taken. Here, again, race-peculiarities have to be considered, since the queen-cells ordinarily formed by eastern bees are not as large in diameter as those produced by Carniolans. It is therefore well to use care in this selection.

The next step consists in the removal of all unsealed larvae from the populous colony which has been queenless during the preceding two or three days. The object of this removal is to force the bees to turn their whole attention to the fifty or more queen cells that are supplied on bars. Should honey-gathering not be going on freely, the colony engaged in the nursing of these queen cells is to be fed daily a pint or more of syrup, care being taken, likewise, that an abundance of pollen is present in the hive. If the weather is cool and changeable, particularly if the temperature is low at night, extreme care should be taken to afford the bees every facility for the retention of the natural warmth of the brood nest. Since, in substituting larvae from the breeding queen chosen, those larvae having an age of twelve to thirty-six hours had better be selected, it may be counted that the young queens will all emerge twelve and one-half to thirteen and one-half days after the transferring or substitution of the larvae takes place. It will, therefore, be easy to provide nuclei (or queenless colonies) for the reception of each one of these queen cells. If, however, it is inconvenient to do this and the cells have been placed at regular intervals upon the top bars, it will not be found difficult to provide a small queen nursery, which may merely consist of a series of wooden cages with wire-cloth sides or small wire-cloth compartments, having a cell or cup in which a small quantity of food may be placed, the cages being placed at such intervals that the bar containing the cells when placed over the cages, permits each cell to slip into a separate compartment. It is by no means advisable to place the cells in a queen nursery until the young queens are practically at the very point of emergence, since the slightest neglect or chilling a day or two previous

to the final awakening of the maturing queen, if not fatal, is highly injurious to the future usefulness of the queen. All are familiar with the indifferent results in the case of the chicks of common fowls should chilling of the eggs occur shortly before the period of hatching. With bees still greater sensitiveness in this particular exists, and it is, therefore, a very mistaken policy to separate the maturing cells during any stage, except that of actual emergence, from the direct and free contact with the clustering bees.

After emerging, the young queens are to be allowed a period of a week to fifteen days for mating. The impulse to fly and mate will be greater if the colonies are in a thoroughly prosperous condition, that is, are well supplied with honey and pollen in proportion to their numbers. While queens of the European races usually mate in from five to seven days after emerging, those of eastern races more often require nine to fifteen days. It follows from this, as well as from the fact that eastern types are possessed of greater native vitality, that the young unfertile queens of the latter will bear, without injury, longer confinement previous to mating than will those of European types. Twelve to fourteen days may often be admissible for the former, while seven to nine days should usually be the limit for the European races. But, in all cases, the less confinement after four or five days the better, and during this period in any instance it will be preferable, in order not to injure the young queens, which it must be borne in mind are not yet wholly developed, although they have emerged and present the appearance of being perfect queens, to have them caged in wire-cloth pipe-covered cages pressed into the surface of a comb, where abundant supply of food is always at their command.

It is hardly necessary to add that an examination of each young queen should be made immediately after she has emerged in order to waste no time in the preservation of those happening to issue with defective wings or legs or ill-developed or crooked bodies. One may even go farther than this, should the supply of young queens be quite abundant, and reject all that do not present the most promising appearance.

SELECTION OF DRONES.

Quite the same care should be given in the selection of the drones (or males) as in the selection of queens. It is true that we may not wholly control the mating, since the queens frequently leave our own apiary while flying out on mating excursions, but in case a certain race is bred in its purity and surrounding apiaries are stocked with those of a different type, it will be quite easy to reject any queens that have mated with drones of another race, retaining, for our own breeding purposes at least, only such as have mated with the stock purposely reared in our own breeding yard. It is, therefore, decidedly advisable to limit drone production to queens which have sprung from colonies coming up to our own idea of what we desire in the shape of workers in our honey-producing colonies. Repeated experiments in crossing various types have convinced me that the drones have greater influence over the temperament and constitution of the workers than have the queens. It follows from this that in these two particulars the general characteristics of the colonies selected as drone-producers must be preeminent. By this

I mean that both the queens to produce these drones and the workers related to these queens, must come up to the general race-characteristics, and must in these cases show most excellent qualities as regards hardiness of constitution, general robustness, and wind-power, combined, in the case of the workers, with the greatest gentleness which it is possible to procure. We are endeavoring not merely to secure the gentleness characteristic of the given race which we have selected, but we wish exceptional gentleness within that race. But it is quite impossible to judge by the drones themselves or the queens producing them, what degree of gentleness these drones may transmit. We must infer that certain drones will transmit gentleness of the workers having the same blood as the mother of these drones, are excellent types of gentleness of the given race. These workers are the sisters of our proposed drone-mother, hence aunts of the drones, and are of course in the colony from which the proposed drone-breeder sprang. The half-sisters of the drones themselves (constituting the worker-progeny of the proposed drone-mother), form but a slight guide as to what qualities of temperament the drones may transmit, because the good or bad temperament of these workers will have come largely (according to the above theory of preponderance of male influence over temperament) from the drone with which the queen has mated. To judge, therefore, whether the drones have gentle blood and hardy constitutions, we must go back to the worker-progeny of the grandmother of these drones—the sisters of the drones' mother.

It is also highly desirable that the element of prolificness should not be lost to any degree, since it certainly appears reasonable that, while we look to the mother of the young queens largely for this quality, still on the male side considerable influence may also be exercised. We may judge of the capability of drones for transmitting prolificness by careful examination of the work of the queen producing those drones. Prolificness in our young queens reappears of course in queen-progeny in the shape of prolificness, but this quality reappears in the workers as a material instinct, impelling them to greater care in brood-nursing. It is, therefore, to be reckoned with as valuable, whether we are using these young queens merely as producers of other queens or to produce colonies for honey production, since the ability of the workers composing the colony to care for vast amounts of brood has plainly its influence over the yield of surplus.

HOW TO MAINTAIN A CYPRIO-CARNIOLAN APIARY.

The question might be asked how we are to maintain a honey-producing apiary headed by queens of one race mated to drones of another, as is the case with the Cyprio-Carniolan type, which I have commended as an excellent one for its hardiness, prolificness, and great honey-gathering capacity. The answer is simply that the home apiary (or breeding apiary) must be stocked wholly with Carniolans as an apiary in which the drones for this combination may be bred, and all queen breeding, or at least mating, may be accomplished. A very limited number of pure Cyprian queens may be kept at one of the out-apiaries, and from these the queen-mothers are to be selected for use in securing cells for the young Cyprian queens, which are then to be mated at the Carniolan yard.

And, since none of the young queens (whether mated to Carniolan drones or not) are to be used as queen-mothers, no heed need be given to the manner in which they have actually mated, at least none of these queens need be destroyed by reason of mismating unless they produce quite objectionable bees.

It will be observed that I have outlined a plan of producing and mating young queens which implies merely the rearing of fifty to one hundred in a single lot. These numbers are capable of multiplication by merely using additional colonies; yet, were I recommending a system for an extensive breeder of queens, certain modifications might be adopted, even to the extent of establishing permanent or temporary nuclei, as the case might seem best, and the use of artificial cell-cups, with many other paraphernalia not needed in such limited operations as I have here outlined. My purpose has been rather to indicate how the quality of our queens may be maintained, or even advanced to such degree as to materially increase the actual output in pounds of honey.

With due attention to the breeding of the queens heading our colonies, with large hives and stimulative feeding during honey dearths, the question of keeping large numbers of colonies in one place is, to a very great degree, solved. I am also thoroughly convinced that with greater heed to the principal one of these factors which I have just mentioned—the rearing of the highest grade of queens, there would be far less complaint of poor seasons and small honey yields than is now the case.

HONEY-BEARING FLORA OF ADAMS COUNTY.

BY REV. W. H. BENDER, *New Chester, Adams Co., Pa.*

For all practical purposes, the honey-bearing flora of this region may be summed up under the head of nine familiar trees and plants. Given in the order of their season the list would stand about as follows:

1. Soft maple, about March 15.
2. Fruit trees, plums and cherry, about April 28; apple, May 6.
3. Clover, white and red, June 1.
4. Locust, May 28.
5. Raspberry, May 28.
6. Wild Cherry, May 28.
7. Sumac, July 6.
8. Catnip, July 9.
9. Aster, September 1.

Given in the order of their honey-yielding properties, the list would stand somewhat as follows:

1. White clover.
2. Aster.

3. Fruit bloom, catnip, raspberry, red clover.*

4. Soft maple, locust, wild cherry.

In this region I have not known Golden Rod to yield honey. We have an abundance of it. A few bees in season may be seen working it for pollen only. As to buckwheat, its honey-bearing properties are well known, but so little is cultivated with us that I have not included it in the list.

During the summer of 1903, we had an unfortunate secretion of honey dew. The bees going wild in their haste to store it, to the neglect of any honey-bearing flower in season at the time.

We will now consider separately the various sources of honey as named in the given list, being as brief as possible. Standing at the head, we find white clover. It is pre-eminently the honey-bearing flower or plant of the region. It grows in profusion, covers wide stretches of cultivated soil with its mantle of green or snowy white flowers, blooms from 8 to 10 weeks, and generally gives the bees a honey harvest of from four to six weeks. Referring to my notes of the past summer, I find it began blooming May 25, and continued in bloom until about August 1. Its honey-yielding period extended from about June 1 to July 6. Were it not for white clover, bee-keeping with us in Adams county would be a losing game. It is our main—I was about to say, our only source of surplus.

And right here we find a hopeful sign. During the last few years the plant seems to have taken on a new lease of life. Old resident farmers and old-time bee-men say they never knew white clover to grow so profusely and vigorously as it has in the last few years. May this not point us to one of the mysterious workings of Nature wherein she makes good in one way the loss sustained from some other source? Years ago the country was covered with a dense forest. The honey bee had an abundance of pasturage. As the forests began to disappear bee-keepers lamented the scarcity of pasture. This has remained the common complaint among those who keep bees in a small way. May it not be, however, that Dame Nature is slowly but surely making good in white clover the loss sustained to the bee-keeper in the removal of the forests?

The next in value with us is the fine flowered aster. I do not know to what extent this plant may be found throughout the State, nor do I know what other names may be given to it in other localities. With us the plant grows in abundance. It is to be found by the roadside, in pasture fields, grass fields, waste places, etc. It attains a height of from 2 to 6 feet, bears a small flower—hundreds of them on one small stalk—that yields a honey distinct in flavor and consistency. In color this honey is golden, in flavor very pronounced sweet and sugary. It has a heavy body and when extracted granulates quite readily. This plant comes into bloom about August 25, and from September 1 until frost the bees have a rich harvest generally.

Again referring to my notes, I find that as to the past summer, September 1 was the first real busy day for the bees on this plant, and that the flow continued until September 28, when a cold wave struck us, a forerunner of the severe frost of October 3, which put the bees out of business for the season. We do not count on much

*Red clover is here assigned according to its available yield to the bee and not according to its honey-bearing property.

surplus from this plant, and yet it is, as per the list already given, second in value to the bee-keeping industry of this region, from the fact that it furnishes the bees a source of winter supply. Its value in this respect will be readily seen from the following data: July 20, when I took off the surplus honey—white clover—the hives as a rule were fairly well filled with stores. September 1, the beginning of the aster flow, the bees had well used up other stores, the result of a honey drouth from about July 15. At the end of the aster flow the hives were again full, and a few had begun operations in the supers when that cold wave struck us. White clover for surplus and aster for winter stores. These are our two main sources.

The principal value of soft maple is its early availability, yielding honey and pollen by the middle of March, and thus stimulating brood-rearing and giving colonies short in stores a limited source of supply sufficient for the time at least.

The same may be said of fruit bloom, coming as it does the latter part of April and fore part of May. There is this difference, however, in that the bees usually gather from this source a goodly quantity of fine, rich, honey for present use, filling the combs oftentimes one-third full. But right here we are face to face with a dire calamity threatening the bee-keeping industry of Adams county. This is a fruit-growing region, and the spraying of fruit trees while in bloom is becoming more general. This is death to the bees. There must be some legislation along this line, or our industry is doomed.

Locust is uncertain. The raspberry, though sure and of good quality, is of limited extent. Sumac and catnip are valuable in that they come at a time when there is a dearth in the honey flow. Especially in this true of catnip. Its time and length of flow, early part of July to middle of Sept., about ten weeks, makes it no mean asset to the bee-keeping industry. I am convinced that many beekeepers do not appreciate this plant as they should. Speaking with a friend upon this subject during the past summer, he said: "Oh, yes; I see the bees working on it much during the summer, but have never known them to make much out of it." This was the remark of a hasty conclusion. In the first place, with us it does not grow very abundantly, and in the second place, it comes, as we have already seen, at the time of a honey drouth, so that the bees seldom store any of the nectar in the surplus, and hence the above conclusion. But while very little is obtained in the surplus, it does furnish a reliable source for the brood nest, and in addition to this gives the bees some employment at a time when otherwise they would be in a large measure idle. My conclusion is that if there is one honey plant worthy of cultivation for its honey yielding qualities alone, catnip is that plant.

PAPERS READ AT THE SEVENTH ANNUAL
MEETING OF THE PENNSYLVANIA DAIRY
UNION, HELD AT THE MONONGAHELA
HOUSE, PITTSBURG, PA., JANUARY 17, 1906.

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CITY MILK SUPPLY.

By MR. C. M. BAILEY, *Manager, McJunkin-Straight Dairy Co., Pittsburg.*

There is no article of food which is so universally used from infancy to old age, and upon which so much dependence is placed by the strong and weak alike, as pure milk. When we consider that it is the only food that will, within itself, sustain life for an indefinite period, and that in thousands of cases it is depended upon entirely to nurse the weak and suffering back to health and strength, we arrive at some idea of the importance of a pure milk supply for our cities.

Of late years a demand for a pure milk supply has developed among physicians, and those laymen who have given the matter the thought that it deserves, and, as is always the case where there

is a well defined demand for an article, that demand is being satisfied to some extent along the lines of certified sanitary dairies and sanitary plants for the Pasteurization of milk.

SANITARY MILK.

The producers of certified milk follow the idea that milk that comes from a healthy cow and is handled in a sanitary manner, cannot be improved upon, and that this is true no one can doubt. Briefly, the method followed by the above mentioned producers is as follows: First, the careful selection of a herd of cows, usually grades of the different milk-producing breeds, that will at anytime stand the most rigid examination by competent vegetarians. This herd is housed in a barn so constructed and arranged that the ventilation is as nearly perfect as it is possible to make it. The floors, stalls, and feed boxes are all arranged for daily scrubbing and kept immaculately clean—in fact, in one dairy that I have seen, when they have city guests out to inspect the dairy, the table is laid for luncheon on the feeding floor between the two rows of cows. The walls and ceilings of these barns are either whitewashed every month or are so finished as to admit of scrubbing down frequently. In this way such a degree of cleanliness is secured as we like to see in the dining-rooms and kitchens of our homes. The cows are usually stable-fed all the year, being allowed out a short time in fair weather for exercise, and some of the herds are pastured to some extent during the summer. They are brushed and carded daily; their sides and udders are wiped off with a damp cloth just before milking. The milkers are required to dress in perfectly clean white suits, and to wash their hands in an antiseptic solution before milking each cow. The first milk from each teat is drawn into a separate pail and not mixed with the certified milk, in order that the colonies of germs that have grown in the end of the milk duct may not get into the milk sold as certified. The milk is drawn into closed sterilized pails through absorbent cotton, and transported to the dairy house some distance from the barn. There it is immediately cooled to at least 45 degrees and filled into sterilized bottles, which are then capped and sealed ready for delivery to the customers at from 12 to 16 cents per quart. Better milk than this there cannot be, and there is a demand in every city of any size for a large quantity of this milk, even at these prices. But the customers must be assured that they are getting what they are paying for, that is, absolutely pure, clean milk of a fair richness.

COMMERCIAL MILK.

The great mass of city dwellers, however, cannot or will not pay such prices as this for milk, and yet they demand a milk that shall be pure and clean, of reasonably good quality, free from drugs or preservatives of any kind, and yet keep sweet from 24 to 36 hours after delivery. Fortunately for this class of people, Louis Pasteur, in his researches to help the wine makers of France, opened the way to what is now called the Pasteurization of milk. This process, stripped of all technical terms, simply means the heating of milk to a temperature of from 158 to 160 degrees Fahrenheit, and the subsequent cooling down to 45 degrees or lower. This treatment destroys the germs which produce lactic acid, which sours the milk,

and at the same time any pathogenic or disease-producing germs which the milk may contain if the cow was not perfectly healthy, or if any external contamination may have taken place while the milk was handled from cow to consumer. Briefly, the milk for Pasteurization must be produced from cows that to all physical appearance are healthy, kept in barns that are whitewashed at least once a year, better twice, all floors and gutters kept clean and sweet, the cows brushed and carded as carefully as you do your horse, their sides and udders wiped off with a damp cloth just before milking. They must be fed on clean, sweet foods, but never just before milking on account of the dust stirred up and which carries millions of germs ready to drop into the milking pails. The milk should be drawn by milkers with clean hands and clothes, and as soon as milked carried into a milk room with a closed door between it and the stable proper. It should then be strained through at least a ply of cheese cloth, then cooled down by use of a Star or Champion type cooler to 60 degrees at the highest, better 50 if you have cold enough water, and finally put into clean cans and send to the nearest shipping station with as little delay as possible.

AT THE SHIPPING STATION.

The shipping stations are usually maintained by the city dealer who buys this milk and as soon as the milk is received at the station it should be inspected by a competent judge for any foreign flavors, dirt, or anything else that might be detrimental to the production of rich, sweet milk, and if found satisfactory, weighed in, ran through the Pasteurizing machines and filled into sterilized cans and shipped to the city, especially in refrigerator cars, where the milk is again inspected by a man whose sense of smell has been trained by long use, to detect the slightest taint that might in any way be detrimental to the purpose for which the milk is intended. After passing this inspection the milk is cooled down to a temperature of 35 to 40 degrees, and stored in large vats at a temperature near the freezing point. From these vats the milk is raised to the filter or clarifier which removes the last trace of any foreign substance which may have fallen into the milk while in course of transit. From these, the milk is taken to the Pasteurizing machines where it for the second time goes through the process of Pasteurization and from this it is filled into sterilized bottles, ready for delivery to the various customers in time for breakfast. It is absolutely necessary, through all these processes and handling, that cleanliness in all that word implies, shall be observed, for in no place is the saying, "Eternal vigilance is the price of success," more true than it is in the milk business both in the producing and the handling.

Right here let me caution you against the use of common soap of any kind in washing your dairy utensils, owing to the fact that the odor of soap as well as the caustic it contains is well nigh impossible to get rid of, and anything with such an affinity for a stray odor as milk has, will be spoiled by the soapy odor very quickly.

The idea that Pasteurization will make good milk out of bad milk seems to have some adherents, but this is a very great mistake; however, when used in connection with reasonable care in the producing,

and handling of milk, it furnishes a milk that compares favorable with the best handled certified milk at a cost to the consumer of half the cost of certified milk, that is, from 6 to 8 cents per quart.

OLD METHODS OF HANDLING MILK.

In contrast with the above methods, let us see how the bulk of milk for cities was formerly handled. In fact there are still great quantities of it being sold daily. Cows, any old thing that will give milk, no difference whether they give enough milk to pay for the feed they eat or not, milked in a stable that is cleaned only when the dairyman can find nothing else to do. Cows never curried, manure sticking to their sides and flanks until they resemble the knight of old in his coat of mail. The milking is done anytime and often the milkers use wooden pails, or worse still, tin pails that have felt the effect of Brindle's hoof so often they scarce look like pails. Milk dumped into cans, not too clean, without straining, or if strained at all, only through a wire strainer, cooled by setting the cans in tank of water only because he knows the dealer will reject it if it is not fairly sweet when received in the city. In many cases the milk is dosed up with preservatives of some kind, though of late years this has become rather a dangerous proceeding, owing to the activity of our dairy and food departments enforcing the laws against adulteration. The milk is then taken to the train, shipped to the city to some dealer who takes it to his sanitary (?) dairy in the basement of some dwelling or store, or what may be worse, to the rear end of some store room, the balance of which serves as a living room for the family, here immersed in a tank of foul smelling ice water, allowed to stand until enough cream has risen to the top, then skimmed until it will barely pass the limit of fat required by the law, or if there is any assurance the inspector will not be in the neighborhood that day, the skimmer goes still deeper. It is then sold from a can, or churn as many call them, placed on the seat of the wagon beside the driver, measured in vessels that are coated with a film of dust from the city streets each time the wagon passes from one customer to the next. Or, perhaps this milk is wholesaled to the corner grocer who stores it in his store along with onions, potatoes, cheese and various other flavor-producing articles. to be sold to his customers at cost in order to draw trade.

Think of it, will you? This milk first flavored with the odor of a dirty stable, and a passing examination will disclose that it contains more than the odor, then with that of a dirty ice tank, than which nothing smells worse, then skimmed and doctored until a self-respecting cow would be ashamed to own it, then flavored with all the various flavors of a grocery store, and then this abortion of pure milk sold to draw trade; rather one would think it would drive it away. And yet there are hundreds and thousands of poor people who have never tasted the nice, sweet, clean flavor of pure milk, and who think this is all right. They don't realize that it would be better to use half the quantity of pure, wholesome milk, that they would get more nutrition for their money. They don't realize it is feeding such stuff as this that causes such a large infant mortality, and if you, the producers of milk could see the poor little half-starved specimens of humanity that city dwellers see on the streets in the poorer sections of the city, you would register a vow right now that you

would not only insist upon the production of clean, pure, wholesome milk, but you would see that the dealer handled your product in a cleanly, sanitary, honest manner or you would find one who did. Upon you to a certain extent lies the blame for the state of affairs which now exists, for these people do not know what pure milk is. And just as long as this class of dealers can buy milk, these poor unknowing people are going to use it.

THE REMEDY WITH PRODUCERS.

Now let us see what can be done to remedy this. First, you producers of milk for city consumption, try to impress on your minds the vital importance of what you are doing to some consumers of your product. Never handle a pail of milk without remembering that this milk may be the means through which health and strength may be regained by some sufferer if you handle their food as you know you should. Then know your dealer and know that he handles your product as he should do. Then hound your law-makers until they will give the Dairy and Food Department enough money to inspect the sanitary end of the milk supply as well as the adulterations. While I do not for a minute believe that any chemical adulteration is necessary, but that it should be followed up as closely as it is being done, or closer if possible, and offenders punished, yet I do believe that more sickness and deaths are caused by milk handled in dirty cans in disease-ridden dairies and milk depots and in filth generally, ten times over than were ever caused by chemical preservatives used in milk. An investigation of recorded epidemics of typhoid fever alone that have been traced to the milk supply will convince anyone of the crying need for action in this direction.

This being the case, why is it not time something was done in this direction? More frequent examinations of the milk supply of our cities and villages are necessary. Examinations bacteriologically, microscopically and chemically of the milk sold by every distributor should be made monthly. If these examinations show the milk from certain distributors is not being handled properly, a thorough inspection of the city plant or depot of this dealer will determine if he is at fault or not. If he is at fault, proceed as deemed best by the Department to make this dealer remedy his methods; or if his methods are found right then examine the milk from the different sources from which he secures his supply in the same way and when the trouble is located notify the dealer and hold him responsible, as it is within his power to either have the trouble remedied, or to refuse to buy the milk from the producer who is at fault. This followed up conscientiously, and it can be done without the expense being burdensome, all milk required to be Pasteurized and all deliveries made in glass bottles that have been thoroughly cleaned and sterilized before filling, and the day of epidemics caused by an impure milk supply will be a thing of the past.

DR. BARCLAY: The first time I prepared a paper on the subject of milk, its production and uses, and read it, I was very much discouraged by many friends on account of the subject being a new one. I read that paper at Louisville, Kentucky, before the Mississippi Valley Association about twelve or fourteen years ago. In that paper I made some statements which were pretty broad and

still somewhat startling. One of the statements was that over 40 per cent. of all dairy cattle in and about the city of Pittsburg were tuberculous, and afterwards many persons seemed to know something about it though I had very much overdrawn the percentage of tuberculous cattle but after investigation it was found I had not quite told the whole truth. It seems to me with all the efforts that have been put forth, and with all that has been said and done by honest dairymen, at least in the city of Pittsburg, we are further away from pure milk than we have ever been. I believe that the milk that is sold in Pittsburg to-day is further from the standard than it has ever been before. We have a large number of places in Pittsburg that I have denominated milk factories. Now, I suspect that perhaps there is very little, if any, milk sold from those which is fit to be used. It would require more time than I feel like occupying in giving the reasons for that conclusion, but I am certain if that milk is tested that it will be found to be about what I denominate "commercial milk," that is, just to evade the law and of the greater part of it I believe would not pass the requirements of the law. Two years ago while in New York and Newark, N. J., I had an opportunity to study the subject of milk. The milk that is produced in New York is very good, very much better than it is in Pittsburg. Another place, not a city, although it is sometimes called a city, I visited some years ago and at once took up the study of milk there and the milk in that place, Asheville, N. C., was the best that I have ever found anywhere. The milk produced on the Vanderbilt farm was over and above anything I have ever found. I suspect the milk in New York is better than that supplied the consumer anywhere in the United States except Asheville. The milk in Chicago is very good. And now, gentlemen, in my judgment, there is only one way to bring that matter to what it should be, that is by efficient laws, and their enforcement. I do not believe that any amount of talk or any amount of moralizing that we can do will ever bring the production of milk to what it should be. It seems to me that there is such a large temptation to be dishonest. Now not very long ago, I was lauding a friend who has a small dairy up in Indiana county. I said I believed that he was an honest man. I was thinking of him and recommended the products of his dairy to a man who wished to buy milk. He said: "That is true. I want to tell you I bought several cans of cream from him. I appreciate all you say, but you have never studied that man carefully. Last summer in the hot season I received from him a number of cans of cream, and it kept well. Why, I kept that for two weeks. It was perfectly sweet, and when I tried to churn it, it ran all over the place. I dipped out until finally I gave it up, there was no butter in it. If there was, I was not able to get it." Now that man is an elder in the Presbyterian church, and I had the impression that he was a perfectly honest, honorable man, and that was a backset, but that is only one of a very large number. It is a difficult thing to find a man who will not be tricky and play you false in the production of milk. Now, I am sorry to say that, but it is true. I know what I am talking about and if anybody objects I can give the facts.

Now the laws of this State are as nothing; we all know that we have had a number of laws, but the laws that we have had have not been enforced. The pure food laws of course are being inforced,

but it is a very easy matter to pay the fine and go on and poison people. I heard the gentleman referring to sterilizing of all vessels, and that point is well taken. As far as I know, the only means for the preservation of milk beyond the time it will naturally keep before it sours is cold. Now, then, the scientific application of cold to milk after it is drawn to relieve it of the animal heat and then keep it at a proper temperature is the only proper means for the preservation of milk in order to produce it fit to be used by the human being.

MR. WELLS: I would like to say a word to emphasize the points brought out in the papers, of the necessity of dairy inspection. By dairy inspection, I mean inspection of the animals, the cows that produce the milk, and the premises, the stables, and surroundings and also the methods of handling the milk. I am satisfied that we will never arrive at any great degree of perfection until some means or some laws are passed to effect this, personal inspection by a person who is authorized to look to this matter. Pasteurization does a great deal, but I look upon that simply as I do upon the water supply. If we can get water that is pure from the fount of Heaven, it is much preferable to putrid water that has been filtered and made fit for use. I do not think we realize, many of us, the conditions that prevail. It was brought to my attention very forcibly not very far from this city. There was a contract made to supply butter for the United States navy, and it was in part under the supervision of the Department of Agriculture, and I was sent to the district to see what the facilities were for producing this butter and the fulfillment of the contract, which had already been made. I spent half a day, with a team and a man driving around and looking at and visiting as many of the various dairies as I could find. It was, I think, some time in April. I did not find a dairy barn that any gentleman in this house would say was fit to keep cows in. In that inspection I did not find one that had a window in it or any proper means of ventilation. The third barn I visited was a large building, one side was arranged for stalls for the cows, occupying two-thirds of the space, and the other third was a pig pen filled with hogs. In talking with the creamery man about it he said they were in the habit of leaving a night's milk setting on the barn floor where it got the fumes of this hog pen. About noon we reached the Secretary's premises. I thought to myself, "Here we will find a barn as it should be." We took dinner there and while the teams were being unhitched, I took the opportunity to go down into the stable. It was noon, and a bright day, and when I got in it, I could not see ten feet from me. I suppose there was one door about wide enough to let a cow in, but no window. It seemed surprising that such conditions prevail, but I know from personal experience they exist in certain localities. We are doing good work in many states in this line by personal inspection. Even if there is no very severe penalties for unsanitary conditions, yet the fact that they are to be inspected from time to time and the reports go to the state has of itself a very beneficial effect.

PROF. LANE: We cannot say too much of cleaning up. It has been my hope the milk producer would have an opportunity to exhibit his production just as well as butter and cheese producers.

You know such contests have never come about as far as I know. You have heard of the Great National Dairy Show that is to take place in Chicago next month, and here there seems to be an opportunity to bring this about, to have a test for the milk and cream producers as well as butter and cheese producers. It has been the custom for a number of years for dairymen's associations to offer prizes for the butter scoring the highest number of points, or cheese, but it seems to me there is all the more reason why the milk producer should have an opportunity to show his products and should enter in contest for prizes or medals.

MR. WILSON: I would ask the doctor if he would recommend Pasteurization of good, sanitary raw milk.

DR. BARCLAY: No, sir. I think it is a mistake. I believe that it never should be done. I think it has so changed its physical condition of the milk that new products are formed there which are very injurious.

MR. REICHERT: One of the questions that confronts the average farmer is "How can I get recognition for my milk for the efforts I display." We put forth efforts to do our work conscientiously and sell the milk so that it would be within the reach of the average person, that is selling at six or eight cents a quart. Any man knows that any one who is producing a pure, sweet milk and a clean wholesome article, and sells it for six or eight cents, has a pretty good job. There are hundreds of dairymen in Pennsylvania who are as conscientious in their efforts, who cannot get recognition simply because there is no law, to help us get the recognition we ought to get for an honest article. The dairymen here are going to do something in the shape of asking the legislature to give us some kind of a law that will enable those of us who are not prepared to spend thousands of dollars in advertising to have our article recorded and recognized simply for what it is, and I believe before we pass the resolution during the day asking for a law there ought to be some kind of discussion as to what we ask for. It would be a good thing to have Governor Hoard tell us what they are doing in Wisconsin. To me it looks as though a compulsory inspection law itself would be violated and inadequate. But I believe that if I and the ordinary dairyman, would know that the State Inspector is going to inspect my dairy once a month, is going to test my milk, and give me a certificate that would be recognized by all people throughout the State, which would tell the condition, and I did not know the time the inspector was coming, that such a persuasive law as that would do a great deal more good than a compulsory law. I offer that as a suggestion for you dairymen to think about.

DR. BARCLAY: I would like to ask the gentleman if he believes conscience prevails in the production of milk.

MR. REICHERT: Well, I am an optimist. I have rubbed up against men for a long time, and while I know that some of us have pretty raw edges, yet it has been my faith after rubbing up against the world for a good many years, that the great majority of men to-day mean to do right if there is half a chance, and I want to tell you that the world is to blame in the majority of cases if a man goes

wrong, for the reason that they pooh-pooh the right, that they put just as good a brand on dishonesty as they do on honesty, thus making it really an incentive for a man to be a little crooked rather than an inducement to do right. For instance, a conscientious dairyman tries to give you five per cent. milk, curries the cows every day and tries to have everything clean, makes all sorts of sacrifices, doesn't get a bit more encouragement than the fellow that has his cows covered with dung from their heels to their ears, that never washes himself, let alone his cans, and that get in close proximity to the pump once in a while. The fellow that is taking in half water and half milk and half cow dung and half something else, gets just the same credit. I think it is the public that is crooked rather than the dairyman. (Applause.) Gentlemen, I believe that the hearts of the people are in the right place if they are given half a show or the least encouragement to do right. The dairymen, along with the rest of the world, will stand ready to do their part.

WHAT DAIRYMEN ARE DOING.

By PROFESSOR H. E. VAN NORMAN, *State College.*

Gentlemen of the Pennsylvania Dairy Union: In coming to this State to take up this work, it was not because there was nothing to do where I have been, but because I believed there was something even larger to do here, and possibly greater facilities with which to do them, and that in the doing I might have a part. I want to call attention to some of the things as they are; then to make some suggestions as to how they may be changed if you want them different.

In the first place, I find that Pennsylvania ranks second as a dairy state in the Union in the value of her products, in the volume of her products both in butter and cheese; but she ranks fifth in the number of cows it takes to produce these products—a suggestion that you are getting better results from the cows you are keeping than some other states. I find that the average production of the cows of this State is only 150 pounds of butter per cow. I do not know yet what it costs to keep a cow in Pennsylvania, but I imagine that it could not be very far from what it is in some of our other states. Therefore the statement of somewhere from \$28 to \$40 would take care of the average cow of this State. When we talk about the average, you gentlemen do not represent the average dairymen of the Commonwealth. You represent the cream of the dairymen, the men who know so well the difficulties of your work and that there is something to be learned that you are willing to lay down your tools and come and try to find out from your neighbors the better way. The average dairymen have reached that state of development. How many of you are willing to admit you are only getting 150 pounds of butter per cow per year?

In my work I have to keep in mind not the creamery alone, but the great mass of the dairymen, and what can we do to help them as well as to help you. If you can sell to the cow the feed at market price and get a return of from fifty to a dollar over and above the cost it is good business. Now, if you can produce the major portion of that feed and also have profit, whatever profit there is in the production, then you have the two profits of the producer and the feeder. Perhaps some of you are located where you have to buy a great deal of food; others possibly are located where you can grow a great deal of it. Each one must take those things into account and work them out to suit. The fact remains that there are a lot of men keeping cows that no not pay. In order to bring this average down as low as 150 pounds there must be a lot who are keeping cows who do not produce that much, and when you come to a careful investigation of fifty or a hundred herds you will find men that are not getting eighty cents for the dollar's worth of feed; and as one man was asked how did he make his farm pay, what did he do to get the other 20 cents, said, "Well, we have to have something to eat up the feed." You see his aim was wrong. He was trying to get his food eaten up instead of trying to get a profit. Most of us look at these things from a dollar and cents standpoint, not merely for the standpoint but because we have to have money in our business, and in the discussion of these things I hope to keep in mind all the time the natural phase of the thing, because if we cannot make the thing add to our income either directly or indirectly, most of us cannot spend much time on it. Indeed it is only here and there a man is willing to put the quality of his product above everything else, whether it costs money or makes profit. Most of us have to have a little profit.

We oftentimes lose sight of the fact that superior quality in itself makes for a profit by increasing a demand for a good thing. It was suggested by the question that was asked, that many of us are not sufficiently good business men, good advertisers, to get our products before the people that want it. I am firmly convinced that in every town of from 12,000 to 30,000 people, there are more people who want a good article and who are willing to pay for a good article than the dairyman with 150 to 200 cows can supply, but it is not every man who can produce a good product that is a good enough advertiser to "get there." There may not be a bit of merit in some things that are advertised, but the advertising has made everybody know about them, and the selling of a thing is oftentimes in the advertising first, and quality, second. We have got to get our good article before the people. You or I cannot perhaps get a new law right off, but we can go at advertising to-day. The question of making people know more about the quality of the thing we have got is before us. I leave that as one suggestion. I speak with a knowledge of the facts that men are doing it, that men are selling milk, good milk from clean cows kept in a clean way, at a price above the market because they have succeeded in making the public know that they got that, and then, as our optimistic friend said, they have that honesty and integrity which in itself is a guarantee that if the milk is this way to-day it will be to-morrow. That is the first thing. The next thing is to make the public know you got it.

We find a great many people who do not know that the whole suc-

cess of keeping milk is keeping it clean, first keeping the dirt out, because along with dirt is the cause of decomposition, and the next point is keeping it cold. That is the whole secret of milk. Pasteurization helps if you have not got both of these conditions. If you have both of these conditions, added to healthy cows, you have no need of Pasteurization, for milk ordinarily should be consumed within two or three days. Good milk will keep that long if it is kept clean enough and cold enough, and "enough" is within the reach of commercial conditions. Dairymen are doing those things. Milk was sent to Paris during the Exposition there that was sweet 18 to 21 days because it was sweet and clean and cold. We have had milk on our table at home seven days old which was perfectly sweet as far as any mortal could tell it. Of course there may have been some little change going on, but for all practical purposes that milk was sweet seven days old. It was from clean cows and a clean place and kept cold, by a man who was in the business, as he said, for fun, but he said the fun was all gone when the balance was on the other side of the ledger. He was not spending a fortune, he was trying to make something and to teach his boys to furnish milk of that kind, as the business had grown from two cows ten years ago to 200 cows last year. Why? Because the fact that this milk came from there, was a guarantee that it was all right. I say dairymen are doing these things, they are furnishing this kind of milk here and there and they are not producing it at a loss, but now what we need is to show the great mass of dairymen some of those things, some of these methods that are successful in making good milk and in making profitable milk, and how are we doing it? We are doing it by such association as this. We are doing it in a number of other states in another line. I want to put the question to you, How far do you want to go in that line? In Illinois they are having five men connected with their station and stationed there and a considerable part of their time during the year is spent in lines of work that tend to bring these facts home to the producers of the state. For instance, this question of the cow. They have one man who goes from farm to farm in a certain section within the limit of his time and ability and teaches those people how to study the question of economic production, how to sample their milk, how to weigh their milk, shows them a plan that is so simple and easy that they can do it, and find as a result of that work that once a man's attention is called to it and he learns how easy and helpful it is, he keeps it up. Wisconsin has a number of men who are doing the same thing. Indiana has recently started in that same line, and we had, when I left there, something like a hundred cows just near the college that were under test, tests that were started and suggested by the college, and helped out in a way with funds which the dairy interests of the state have provided. Now, the point I want to make in connection with these suggestions is, that we at the College cannot do very much except that we do the things you want done and provide the wherewithal to do it. Now, in taking charge of the dairy department there at the College, I am prepared to do all that I can to help you in your work in any line that our department can so far as you are ready to have help and provide the means to give it. Whether it shall be in teaching the boys that you send there how to make butter, how to handle milk, how to inspect milk, how to

make cheese—whether it shall be in carrying on tests, investigations or demonstrations and experiment, or field instruction among the creameries. In Indiana we have one man who gives his whole time in travelling from one creamery to another, spending a day or two there helping the butter maker to overcome the difficulties that he finds there. What is the justification for that? In three times inside of two weeks was he able, by a couple of hours' work in the creamery, to save that creamery man from one to three dollars a day. Who gets the benefit of that? It comes back to the patrons of the creamery, because it has reduced the expense of making that butter or the cheese as the case may be. In this case it was butter. Now, dairymen are doing those things in other states, what do you dairymen want to do in this State? I am ready to help to work out the problems just as fast as the advantages will permit. Minnesota made a good showing at the World's Fair, because of the work she had done among her people. Wisconsin has done her work along the cheese line. Indiana and Illinois are doing their work among the manufacturers. Canada has over 30 men working along these lines. So much for what some of the conditions are and what some of the things are that dairymen are doing to support and help and overcome them. Dairymen of other states are carrying on, in connection with a meeting of this kind, a dairy exhibition. Why can't we in Pennsylvania have a big dairy meeting show in which we shall have butter and cheese and possibly milk, for this is a great milk producing State for the retail market. Why can't we have a dairy machinery show in connection with it where the creamery men, the butter makers and farmers can come together and see the latest machinery. Those things are being done in other lines. One suggestion comes to the breeder* as to what the dairymen are doing. I picked up a report the other day and in the back I saw an "ad" like this: "We keep our cows for profit. Our cows averaged seventy-four dollars over and above the cost of feed for the last year. We have two bulls for sale from cows of this kind." I just thought, there is a breeder that is going so far ahead of the average that he ought to be advertised from one end of the country to the other. Now, when our breeds of dairy bred cattle will quit glueing their eyes to pedigrees entirely, and look to the production of this kind, and show the average dairymen a bull from a cow of that kind will sell. I believe it is good business for you folks to think of that thing.

I want to say a word, in closing, about this matter of milk inspection. I haven't the thing worked out to where I have a cut-and-dried-plan that I am ready to lay before you. But I will say that this work and these things have been impressed on my mind by observation so far. Therefore, if the state or the government, or whoever inspects that product, is going to determine the quality of the milk used in Pittsburg to-day they have got to inspect everybody's milk that comes in. It is not easy. It is impossible, it is impracticable, it is financially impossible to do that thing, at least in the near future. The quality of the milk is determined very largely by the conditions under which it is handled. Now I believe that our inspection should be directed more to the changing of conditions under which the milk is produced than to an examination of the milk after it is produced, because milk that is produced in clean places

from healthy cows and handled in clean vessels is pretty apt to be wholesome and healthy. Then a very little inspection to guard against skimming and so forth will do the work. In order to do that our inspectors have got to be not medical students who are trying to work themselves through college, to medical school, and because of some good friend in connection with the board of health, or city alderman, get the appointment as milk inspector, but be some practical farm men who know when a stable is commercially clean. There is a cleanness that is theoretically clean, and can only be obtained in the laboratory. There is a cleanness that is dollars and cents possible. The cows can be made clean enough so they don't have to be curried, they don't have to have manure all over their flanks. The barn must be made light. The inspector comes in and sees the barn is not ventilated, and he tells them you cannot sell milk until you fix those things up. When our inspection takes that phase the great mass of milk that comes into our city will be better. We have got to have an inspector who not only knows what is proper, but has sufficient integrity, strength of character and good business judgment. One city inspector in a western city, if you paid something, your place passed inspection. We can't get rid of that entirely. I am like my friend, I believe most of us are honest all right, I believe that it is possible to get this class of inspectors when we go after them. Then inspecting these conditions means our seeing the milk shall be clean. If the man who produces and handles the milk has not a clean stable, you can't have clean milk. He has no facilities for getting hot water and cleaning the tins, scalding the tins in which his milk is handled. You may as well shoot at a stone wall as talk to him about cleanliness. You cannot get rid of the germs that come from lack of cleanliness under those conditions. I believe we have got to direct our inspection then at these conditions, and control them, and I think the tendency is that way.

Now, one other point. The public, that great undefinable, ungetatable somebody that dictates what will or won't be, I believe we have got to put a part of our time in educating the public as to what good milk is. It is one of the purposes I had in mind, a scheme somehow or some way to show our public the difference between good and bad milk. I am open to suggestions or anything that will help educate the public, because the public is just like Pennsylvanians. Now, when we show the public that there is a real difference in milk, then they can understand. The average housewife talks about bacteria and things of that kind—it is something she listens to, but don't know what it means. A part of our effort must be directed to educating the public as to what clean milk is and what cold milk is, and the result in quality of having those few things.

I started out to sell cream in a little town where our college was situated. Our cream sold for ten cents a pint. I said to the best grocer in town, "I will sell you 40 per cent. cream at 20 cents a pint." "Man," he says, "folks won't pay that price. They only pay 10 cents." "Yes," I said, "I know that. Are they satisfied?" He said no. I said I would send him over four pints. It was put up in paper packages so it did not have to be returned. I said, "You give that to four of the best customers. It is an experiment.

Then you report." He started in. He took about five or six pints a week, and in a few months he took 40 to 50 at twice the price. Why? Because, in the first place, the quality was there, and in the next place I took pains to educate that grocer, and I told him that the whole secret of milk was keeping it clean and cold, and to tell his patrons how to keep it cold, tell them not to pour it in some dish that had been wiped with a towel. Here is a little thing—there are over three thousand times as many bacteria on that utensil which you have wiped with a clean towel after scalding it, as there were if you had simply scalded it and left it hot. I demonstrated that by experiment. It would not shine as if it was wiped, but it would be bacteriologically clean without wiping. If they take that kind of cream and set it in a pail of cold hydrant water, it will be all right. How many housewives, how many dairymen, who set their cans in water, know why it is? They do it blindly, because they have been told to do it, and still don't know why they do it. Because it simply gets the milk cold quickly. We took pains to educate. I had the grocer send back a can five days old. I asked him why he did it. He said he was afraid to give it out. It was perfectly sweet so far as the taste could detect, and the acid test showed it had not increased in acidity to the point where we could call it sour cream at all. I speak of that to emphasize the value of educating our consuming public. And while that was only a little bit of a spot in the great field, if each one of you created a little spot around where you are, just think how many there would be going inside of a year. Things grow pretty rapidly. You know one germ developing in an hour makes two at the end of the next hour and then four at the next. How many do you suppose it makes in twenty-four hours? 16,000,000. Just one every hour. Now if you made one little spot in which the public knew more about the quality of milk, and next year we got another and another, how it would increase! Around your neighborhood, as soon as they find out what you are doing, some of them will follow you. Then this gospel spreads, and after a while we can get our public educated to a better appreciation of the differences in milk, and then the man who has got good milk will have it known and a sale for it.

One way that is very effective is to advertise if you have a good milk. And if you can go to your local physician, get five of those physicians to go out to your farm and inspect your place and plant, and in a signed statement say that the herd was clean, the place was clean, that the milk is produced under clean conditions—they would not hesitate to recommend it—you can afford to pay \$10 or \$25 for a space in the local papers, and then print that statement. If you make the right kind of milk I do not believe you will find many towns where the physicians are not willing to do that. If you have not a city inspector whose word counts, get him to do it, or get any disinterested party. Say to the public, come and see whether they are right.

My talk has been rambling, and perhaps disconnected, but the whole thing boiled down to this: There are lots of leaks in our dairy business. First, because we don't know them, and next because we don't know how to overcome them. We have machinery to help overcome those things. We want to increase its usefulness, strengthen our educational field work, and have our dairy show

and get these things going. There is a recognition of educational work to-day that is very gratifying and which is so just in proportion as that educational work bears dollars and cents in return. It is useful to the commercial man; it is a help to me if you will come up and see what we are doing at the State College. Anything we can do to serve the State which created the institution and supports it, I shall be glad to do my part in helping. I hope I may have the pleasure of seeing you all up there and showing you what we are doing.

MR. STOVER: Shall we put the milk into a hot vessel after sterilizing?

PROF. VAN NORMAN: Yes. Scald it instead of wiping. Scald it and turn bottom side up on the shelf until you get around, and then when the customer goes out to the street, if that is the way you require them to do, have the vessel carried bottom side up, so the dust will not settle in it. Dust is the airship on which these germs of fermentation and putrefaction ride around.

MR. CAMPBELL: Would you think that a milkman that peddled loose milk, or a housewife that bought his milk was an ideal milkman or an ideal housewife?

PROF. VAN NORMAN: It may not be the ideal way. It will be the way that will be used for a long while in a great many places.

GOV. HOARD: How many milkmen ever know or take any pains by special effort to educate a family how to take care of milk?

PROF. VAN NORMAN: I know of only two or three. The number is small, but the success of these two or three makes me suggest it.

MR. MARTIN: Wouldn't it be better to keep the temperature down below 40?

PROF. VAN NORMAN: Yes.

GOV. HOARD: At a certain place we had 1,500 families in a city we supplied with butter in the winter. The butter was specially delivered to them. It was our experience that we had to make a special missionary effort to teach the average housewife how to care for that butter, in order to save our reputation. May it not be the same also in regard to milk? The average hired girl and the average refrigerator are not always the most savory propositions of the household.

MR. BARCLAY: Now, this sermon we have just listened to by the Professor is the truth, the whole truth, and nothing but the truth. When he tells you that cleanliness and that cold are the means of caring for milk, he told you, in my judgment, the whole truth.

GOV. HOARD: Is there any cowy odor in the milk, unless there is manure introduced into the milk?

PROF. VAN NORMAN: This much we do know, the new milk aroma is a little different from what it is any other time.

GOV. HOARD: That it is very volatile.

PROF. VAN NORMAN: And very soon goes away.

DR. ARMSBY: We have been experimenting by putting an animal into a box, a respiration apparatus so-called, where we analyze all the excreta in the course of that experiment. We pumped air through that box to ventilate it. Most of that air discharged out into the room where we were. The solid and liquid excreta is dumped into a box under the platform, and under those conditions we could scarcely detect any of that cowy odor in the air as it comes out. You can notice it. In a thousand cubic feet of air discharged into the room very little of the odor was noticed. When we opened that box down below, then you get the cowy odor strong, and moreover the particular thing that carries the cowy odor in our experience is the urine, not the solid. With a little bit of the urine on anything that cowy odor will cling to the thing most persistently, so I think the cowy odor is just as you say, it is in the milk.

PROF. HILLS: A good many years ago at the experiment station we tried a series of experiments of this matter of aerating milk, at one time in cold water, and another time in artificially warm but otherwise pure air. And what we drew from that experiment was that it was not so much the aeration as the cooling of the milk that did the business. The air, as such, is not a medium which promotes or increases the keeping of the milk. It is the cooling one gets, incidental with the aeration. Now, there is another point about this "loose milk"—that is a brand new term to me, I never heard it in New England. One of my associates of former years is likewise a milk dealer, and he had a herd of 750 grade Jersey cows. Up to about ten years ago milk was peddled through that city in this loose fashion, and he was the first one, I think, to put it in the common sense bottle, and he was a man who was brought up in a college atmosphere and one in whom the spirit of investigation was strong. He said to himself, I want to determine whether this is a dollars and cents proposition, to put in this bottling, and I will do it for a year and keep an account. He made a careful estimate. He found that from the standpoint of dollars and cents the putting in of those bottles as a means of peddling milk, as against peddling loose milk was a saving to him. The question arises. How can that be, when you take into consideration the initial cost of those bottles, and for the mechanism for filling the bottles? He found it to be quite an economy. It did not pay in one year the whole expense but it paid.

PROF. VAN NORMAN: In connection with the bottles, I may make this suggestion. Those of you who take up bottling, or who are making a change in your methods, consider the advisability of paying your driver on the basis of a minimum guaranty, say \$30 or \$35, and a certain per cent. for every hundred bottles brought back.

A Member: What do you consider the best kind of cow stall?

PROF. VAN NORMAN: The stall which will give the cow most liberty and keep her the cleanest. Each one will have to figure out to suit his own conditions and case.

MR. HULTON: Would you advocate the use of a manger at all?

PROF. VAN NORMAN: The question of a manger depends upon what you mean. A manger is where the cow eats her feed.

MR. HULTON: No manger at all, simply a hay rack to feed from, galvanized buckets, and rinse out clean every time you feed. And no feed left in the manger to make dirt.

PROF. VAN NORMAN: Any method that works is all right. If it works it is good. To me the labor of the cleansing of those buckets every day would overbalance the good.

A Member: Haven't you found it is hard to keep the cow clean where the manger is used?

PROF. VAN NORMAN: If you can keep the cow back with her heels on the edge of the trough, you can keep her cleaner. Now then does the advantage of the loose bucket that has to be washed after each use, pay for the labor?

DAIRY INSPECTION.

By GOVERNOR HOARD, of Wisconsin.

Mr. President: I am quite familiar with all the work which is being done to-day in Wisconsin. Let me say in the first place, that we have about 3,000 cheese factories and creameries, and we have somewhere in the neighborhood of 150,000 to 175,000 farmers contributing milk to those institutions. We have been confronted, in the progress of our dairy work, with the difficulty of securing cleanly work on the part of the cheese factory and the creamery and the farmer. We have suffered severely in the revenues of the state. We are suffering in Wisconsin, just as you are in Pennsylvania, from the indifference of the farmer to his own education. A large proportion of the men who supply milk to the cheese factories and the creameries in Wisconsin do not read a word. I would say not over fifteen or twenty per cent. of the men in Wisconsin who supply milk ever read a word on dairy subjects. This is a larger per cent. than is to be found in almost any state. It cuts out a large percentage of his profit, it makes him helpless before the difficulties of his own position. You cannot put the knowledge and understanding into his mind if he will not familiarize his mind with principles. In like character, but not to that extent, do we find men running cheese factories and creameries in the state who won't read or study, and who have no contact with information. I think the most powerful word in all the English language is that one word of seven letters, c-o-n-t-a-c-t. Men educate themselves and grow in knowledge and understanding in proportion as they have contact, with books, ideas, things, men. Now, when a man refuses himself contact, what then? By an inverse ratio he becomes not as gods, knowing good from evil,

but becomes a helpless creature to his environment. Now, we found hundreds of men running cheese factories and creameries in an unsanitary condition. We found ignorance defied, ignorance worshipped, rolled as a sweet morsel under the tongue, men worshipping ignorance. Let me give you an example: In one county in Wisconsin, occupied chiefly by Swiss people, ten million pounds of Swiss cheese is produced. We could not get those Swiss people to have any affiliation with our educational movement with our dairy association, with our dairy conventions, with our farmers' institutes. Like the average German everywhere throughout the world, they were full of their own racial prejudice, and I am part German myself. These Swiss people were full of their own conceit, and nobody on earth knew as much about making cheese as they. All at once there broke out through that district a tremendous disaster. One factory lost \$3,000 worth of cheese, the cheese were bursting with fermentation. As one old German said to me, "What you call the devil, is to pay." "Yes," I says, "I guess so." For the first time in their lives they saw they needed the help of science on this question, and that their conceit did not help them a bit, and they appealed to the Wisconsin Association, and we sent an inspector to examine the condition of things. And what did we find? In the rear of each factory was a row of barrels, sunken in the ground, and each patron had a barrel, and every patron's whey was put into that barrel, and that barrel had not been cleaned in years, and the patron put that stinking rotten whey into the can that he brought his milk to the factory in, and took it home, and then the housewife cleaned and maybe she did not. Anyway, the milk came back to the factory reeking with bacteria and fermentation and all things whatsoever vile and unrighteous. And what was the result? Thousands upon thousands of dollars lost to those people because of self-conceit and ignorance. Now, then, we finally prevailed upon those people to listen. Professor Russell, our bacteriologist from the University, was sent down, a very practical man, not only a scientist of the very first water, but a constructive, practical man as well. And he went down there, and he did what he could, and we sent the inspectors, and the inspectors went around among these different creameries, and these cheese factories, and commenced to teach that cleanliness was among the first fruits of righteousness and good cheese making. The difficulty was cured. These men, for the first time in their lives, saw how they had corrupted their own fortunes. That is one of the things an inspection force was able to do.

Now, then, we found that finally we worked up a sentiment in Wisconsin to such an extent that we prevailed upon the legislature last winter to give to the dairy and food commission an additional force of eight inspectors, an additional chemist, so now the dairy and food commission has a force of I think 14. Minnesota is ahead of us. She spends about \$30,000 a year in fostering and promoting the dairy interests. Wisconsin will spend in the neighborhood of twenty to twenty-five thousand. Wisconsin has been paying to its own state dairymen's association, not an incorporated body, a body which I may say I first organized myself in 1872, \$2,000 a year for doing educational work in the state. Now, then, we have got our forces into shape. What have we done? We have prosecuted 24, dirty, filthy cheese factory men after sending an inspector around

and saying to those men: "You must conduct your factory according to law; your factory is in an unsanitary condition. You have no right to ask the patron to be clean in his milk if you are not and will not be clean in the handling of it." Those men paid no sort of attention to this work. The inspector went there a second time, and they laughed at him, and some of them threatened to drive him out of the factory. Ignorance! Ignorance! There was a time when God winked at ignorance, but He got tired of it. Ignorance! The conceit of ignorance, the willfulness of ignorance, the danger of ignorance. What result? Commissioner Emery proceeded to prosecute these 24 men for keeping their factories in an unsanitary condition, and they were fined severely—from \$25 to \$50 apiece. Then there was a waking up and a shaking of dry bones. Creamery men have been prosecuted. Now, the law says in addition, that no farmer shall bring milk to a cheese factory or creamery in an unsanitary condition. And the law bears upon the milk producer as well as the milk handler, and I want to say to you, gentlemen, that I never saw such a quickening of the dairy sentiment of the State of Wisconsin as has happened since the passage of these laws, and the beginning of their installation. Now, this is an important thing, a very important thing to all of us.

Now, I say this about the inspection business, that one of the most valuable things to-day is that it compels the farmer, stops him and compels him to exercise his mind. He begins to say, "Well, what is this thing that is going to happen to me?" And you will find that at the cheese factories and creameries, the patrons will come together; it provokes meetings among them. The creamery man, the butter man is called on to explain to these people what this law is, and there is a beginning to face, for the first time in their lives, the actual real responsibility of their action before the law. That is conducive to thought, and that compels men to study. I want to say to you, gentlemen, we have never seen anything that has taken hold of the mentality of Wisconsin, particularly the agricultural classes, like the establishment of this system of inspection throughout the state. Now, I believe, I know, that Pennsylvania is a great dairy state, if it only knew it itself. In Pennsylvania you are like a great rope of sand. You are not organized, you are not compact, and you are not put in the shape where you can act and re-act on one another. Wherever in the United States you find a state so organized and so compact that its action and re-action, flection and reflection, upon one another, in this state legislation has followed and the state has been put upon advanced ground. You will find in every instance that great financial prosperity has followed such action. And if I were to appeal to you from no other consideration than that of the most sordid character, the dollars and cents there are in it, I would say, move upon your legislature under wise direction for the enactment of such laws, and for the creation of such forces.

MR. NORTON: What brought to my attention this matter in the first place, was I found we had no way of making our patrons make good milk. They would keep their cows dirty, and bring us dirty milk. I got to thinking over the subject. I saw that this dairy inspection law in Michigan and Wisconsin was working well. I could see no reason why our State should not have a similar law. As

Governor Hoard has stated we are behind the times in Pennsylvania in our interests as dairymen. It is time we woke up. You cannot make pure milk out of milk that is contaminated at home. Dairy inspection must begin at home. It does very little good to inspect that milk after it reaches the city, or after it reaches the creamery. You cannot Pasteurize the dirt out of milk. Mr. Reichert brought up the question this morning that he did not believe in a compulsory law. Well, I do not know; I have had a good deal of experience with farmers. I know a great many men, unless you have got something that will compel them to do a thing, will not produce a good article. It has to be compulsory. In my mind a law that is not compulsory is no use in Pennsylvania. I do not know what it may be some other place, I think I can safely say, the Breeders' Association will be ready to help you all.

PROF. HILLS: The result of the inspection in our state has been to lessen the amount of butter that is made.

DR. BARCLAY: It seems to me that this question is one of paramount importance, and that milk, as all other products, should be sold at its value. If we had a law that would compel inspection and that would pay the producer the real value of the product, it seems to me that would encourage and benefit the dairyman.

MR. WAGNER: Possibly we might have force added to the State Live Stock Sanitary Board. I would like to hear from Dr. Pearson what the State Live Stock Board is doing in the way of improving the condition and output of the dairies of the State; also whether he could not give us some plan or suggestion by which we could improve the product by adding to the force of the Live Stock Sanitary Board.

DR. PEARSON: This subject is one I am very much interested in, and I think that I can see in this direction a chance for great dairy improvement from every standpoint, from the standpoint of the purchaser of the milk, the creamery man, and of the consumer. When dairying was conducted in a simpler way than now, before the days of co-operation, a fault on the part of one producer injured his own product, but did not injure the product of his entire neighborhood. Now, under cooperation and under the creamery system, a few careless producers not only injure their own product, though it sells for a lesser price than it otherwise would, but they injure the product of their careful neighbors. Apparently there is no effective way of reaching these careless men excepting by some sort of inspection, and as Mr. Norton has brought out, there appears to be no particular advantage in rules or laws of inspection unless there are some means of enforcing them, unless some penalty is provided for violation of the standards that are adopted. If such a thing as this is carried through I should be in favor of a very moderate standard to begin with, but with the understanding that these standards would be increased as rapidly as the conditions of the trade warranted. In my work as State Veterinarian, I come across some places where milk is produced that cannot but be of tremendous harm, both with relation to the character of the producer of milk, the milk value, and the product, and also with regard to its whole-

someness. There is, at present, no general inspection law under which a joint inspection can be made with a view of discovering such conditions, and I think that it would be a step in the right direction and a step decidedly progressive to take some action such as has been proposed.

The PRESIDENT: This is an important subject, and I hope we shall not leave it without taking some action, looking towards the accomplishment of some practical results. It is a good thing here to-day, and if we limit ourselves to that discussion, we shall not accomplish very much.

MR. NORTON: I have a resolution.

The PRESIDENT: That would be in order.

Mr. Norton read the following resolution.

Resolved, That the Pennsylvania Dairy Union advocate the passage of laws requiring efficient inspection of places where dairy products are made and handled. And, further, that the Board of Directors is hereby instructed to look up the laws of this and other states, and see that a bill is introduced into the next legislature to secure such inspection.

The PRESIDENT: What action will you take in regard to this resolution?

It was moved that it be adopted which motion was seconded.

MR. REICHERT: I should like to ask a question if it is in order. It seems to me, that in order to get the greatest amount of good out of any bill that we might present to the legislature, that there should be a committee to consider the character of the bill that is to be presented, and that all the members of the Dairy Union throughout Pennsylvania, in fact all dairymen, should be invited to send communications, with suggestions to that Committee, so that in addition to getting the benefit of the laws in the other states, we would have the suggestions of our own dairymen throughout Pennsylvania, and make a law as thorough as possible. It seems to me that would be the shortest and the best plan to get at it.

GOV. HOARD: Why not create here a committee on legislation?

MR. REICHERT: That would be better, and then invite ideas.

GOV. HOARD: To whom the propositions come, with instructions that they prepare from all this data a suitable law to be proposed to the next session of your legislature.

MR. REICHERT: That is my idea exactly, to get the views of all of our people throughout the State to give the committee a chance to know the wishes and opinions of the people through the State. I think that would be a very desirable way to get at it. Has the Chair some plan by which we can embody that in that resolution?

MR. NORTON: We decided we would leave that in the hands of our Directors. No one is more alive to the interests of the Dairy

Union and the dairy people of the State than our Board of Directors. In the resolution you will also see it gives them the authority to get the laws from not only our own State, but from other states before drafting this bill. Now, so far as the bill is concerned, that is something we cannot do to-day. It has got to be left with these men to draft, and I personally think it should be left with the Board of Directors.

PROF. VAN NORMAN: There is nothing to prevent the Board of Directors, if they do not care to undertake it, appointing a committee from their number to take charge of this thing, to be a legislative committee.

MR. WAGNER: The Board of Directors can gather all the information they choose on the subject, and present it to the next annual meeting which will be before the meeting of the legislature, and the bill can be discussed at the next annual meeting unless it would be possible to bring it up at this present session.

MR. NORTON: I do not believe that this ought to be left for the next annual meeting. I believe that the incoming Board of Directors and President and Secretary should take up the matter at once. My experience in the legislature is, you do not want to wait until the last minute before the legislature convenes. I may be wrong, but if you want to put this in form of a motion, I feel that it ought to be left with the Board of Directors to pick a committee here to-day. I don't know whether they will wish to do that or not.

The resolution being put to vote, it was unanimously carried, and the Board of Directors are instructed accordingly.

SOME PHASES OF THE DAIRY INDUSTRY.

By MR. C. B. LANE. *U. S. Department of Agriculture.*

This has been a year of great prosperity to the diarmen of the country. Both butter and milk have sold for higher prices than last year and these combined with increased production have given a value to dairy products of fifty-one million dollars above the estimate of a year ago. The income of the dairy cow is only exceeded by the corn crop. It is significant that when the dairy farmer is prosperous, others who have anything to do with the development of the dairy industry share in the profits. For example, the dairy supply houses, dairy publications and manufacturers of dairy products of all kinds. Our population is increasing faster than the supply of dairy products. I believe, therefore, we can expect profitable prices for high-class products for some time to come.

QUALITY OF DAIRY PRODUCTS IMPROVING.

In spite of the sensational articles which frequently appear in the daily press, to the effect that milk is produced under filthy condi-

tions, that typhoid and scarlet fever are disseminated through milk, that butter is adulterated with renovated and cotton oil, and that cheese is poor in quality. When we take a broad view of the matter we find that dairy products as a whole were never better than they are to-day. Take, for instance, the milk supplied to the city of Boston. One of the up-to-date milk contractors recently had the milk from the entire number of farmers (119) furnishing him with milk from a single town, examined for bacteria, and they found only $2\frac{1}{2}$ per cent. below the Boston requirements. This may be taken as a fair illustration of the condition of things in a community of intelligent milk producers.

Again, the mortality of children under five years of age has been reduced from 43.84 per cent. in 1875 to 28.87 in 1904. Both New York and Philadelphia show a similar improvement. There can be no doubt but that this improvement is due in no small degree to the better farm conditions and better laws and health regulations. The result of the recent case in Philadelphia, where two grocers were fined \$250 each and sentenced to 60 days in the county prison for supplying oleo as a substitute for butter shows the activity of inspectors to put down fraud.

The demand for high grade products is increasing. Many of the certified milk producers are unable to keep up with the demand for their products. One party I have in mind, who is selling the milk from 500 cows at the rate of 15 cents per quart told me that the demand for their products was so great that they were already preparing plans for a barn to accommodate 800 cows. Another made the statement that if he had a million dollars to invest he would put it into the production of certified milk. The demand for milk of high quality that is not sold under a guarantee is no less noticeable. Many have advanced the price with the result that they have not only held their regular customers, but added many new ones.

PRACTICAL RESULTS OF AN EXPERIMENT.

A discussion of this matter from the practical side will doubtless be of more interest to dairymen. I wish to give here some of the actual results secured from the dairy herd at the New Jersey College farm, when in my charge, and the sale of its products in retail trade. The sale of milk was made in competition with other dairymen, without any other advantage than a good product. The number of milch cows in the herd ranged from 23 to 30 and they were largely grades. The composition of the milk of the different animals ranged from 2.8 to 6.4 in percentage of fat, and averaged 4.3 per cent. The standard of richness for the milk as delivered to consumers was fixed at a minimum of 4.0 per cent. fat, as it was found that with care in the arrangement of the animals in the barn, so that the milking might take a certain order, it was possible to furnish from day to day, a product that was practically uniform in composition. This herd served in carrying out a practical experiment on a large scale, to determine whether uniformity, richness and purity could be practically accomplished, and whether, if these characteristics were possessed by milk delivered to consumers, the result would be a larger consumption at a better price. The experiment began in 1896, and during that year it was only possible to in part

guarantee uniformity and richness as it was necessary first to improve the buildings in a sanitary way, remove the unhealthy animals, arrange for better cleaning of the animals and stables and for proper handling of the milk, and to teach all connected with the work the importance and necessity of cleanliness. This was not finally accomplished until late in the summer of 1897, when a dairy house was built, which enabled an immediate and rapid cooling of the milk and its storage at low temperature until delivered, as well as the sterilization of the necessary utensils. In the meantime, however, the relative advantages of different methods of delivery were studied, and the marked advantage of the bottle system from the sanitary point of view was so obvious that the consumers were encouraged to take milk in this form rather than from the open can.

The product was sold entirely upon its merits. No persons were solicited to purchase milk, no advertising was done, and in no case was the milk sold for less than six cents per quart for the six months beginning with May, and for eight cents for the remainder of the year. The sales made during the year beginning April 1, 1896, when progress was being made in the production of milk of a uniformly high quality, and during the years 1898 and 1899, when to these characteristics purity was added, are actual statements taken from the records. The results are as follows:

During the year beginning April 1, 1896, the sales were 64,616 quarts; the following year (1897) the sales were 68,230 quarts, the gain being but 3,614 quarts, or 5.6 per cent. more, while in 1898 the sales were 78,839 quarts, a gain of 12,373 quarts or 18.9 per cent. over the sales in 1896. Again, the sales for 1899 were 81,930 quarts, the gain being 17,314 quarts, or 26.8 per cent. over the year 1896. That is, though uniformity and richness were practically maintained throughout the first two years, owing to unclean animals souring, and sales increased slowly, but as soon as the milk delivered possessed the three characteristics mentioned at the outset—namely, uniformity, richness and purity—it began to sell itself and no legitimate complaints were heard. The increase was marked and has been increasing from year to year; in fact, we have sometimes had 25 customers on the waiting list. The increase in sales of 18.9 per cent. in 1898 is, on the average, 33.6 quarts a day, which at the price received, an average of 7 cents a quart, is a total gain to the farm of about \$1,000.00 in the annual income. This is obtained too without other increase in the cost than in the extra animals required and in the feed, the labor required for handling the milk, both in production and delivery, is the same as that found necessary in the smaller product. The results of this experiment show that there is wide room for development along this line, that dairymen can, by attention to these matters, both increase their sales and secure a better price. The key to the situation is the making of a better product.

A statement of the September receipts for milk in New York City shows that there was a total increase of milk, cream and condensed milk over the same month in 1891, equivalent to 4,848 cans of plain milk. This should give some encouragement to the producers. The conditions for manufacturing butter in this country are as good as in any, and one reason we do not produce more high grade butter is because of carelessness on the part of creamery

and cheese factory patrons. We are eating all the high-class butter we produce and millions of pounds of oleo, butterine and renovated butter besides. Of all nations, the Americans are the greatest butter eaters. This cannot be said of cheese, and the consumption of this product should be encouraged both because it is a healthful and economical article of food.

PRODUCTION TOO LOW.

One of the weakest points in American dairying is the low production of our cows. We certainly cannot point with any pride to the record of the average cow in the country, which is about 3,560 pounds of milk and 152 pounds of butter. I believe it is safe to say that more than one-half of nineteen million cows do not pay the food they eat. To illustrate: Of one hundred herds in a New England state recently canvassed by "Hoard's Dairyman," the average pounds of butter fat produced per cow, per year, was reported to be one hundred and fifty, equivalent to one hundred and seventy-five pounds of butter. This is a little higher than the average for the herds for the whole country, it is true, but it is only about two-thirds of the yield that could readily be obtained with care in selection and feeding. Sixty-nine herds out of the one hundred failed to pay for their feed. The best herd returned \$20.75 per cow more than the pay for their feed. This record can easily be made by every dairyman. The owner of the poorest herd lost \$21.68 for every cow in his herd of sixteen, which is more than the best herd gained. Patron 80 which had the most profitable herd (made up of grade Jersey cows) it is reported, gave them the most intelligent care. Hay and corn fodder formed the roughage, and 4 to 7 pounds of wheat bran and cotton seed meal were fed, while the cows were in milk. A warm, well lighted stable was noted. He was a reader and careful student of the needs of the dairy cow. Patron 74 had the poorest herd, made up of 16 grade Jersey cows also. Hay and a small amount of ensilage were fed and about six pounds of brewers' grains, wheat, bran and cotton seed meal. The trouble here was not with the ration, but poor cows and poor care. The business must be studied from all sides. Here we have a difference of 112 per cent. in two patrons living less than a mile apart, under practically the same conditions, and a difference of \$42.40 in the net income per cow. The difference in profit must be attributed largely to the difference in the intelligence put in their business. Here is an opportunity for dairy missionary work that I believe would be appreciated.

Many dairymen make the mistake of thinking that it is enough to know what the whole herd produces month after month, and what the whole herd tests. They depend too much on the returns from the creamery or cheese factory. Let us analyze this plan and see how much it will help to improve the herd in the future. It does not help any. To be sure, it enables you to compare one month with another; it shows you the average for your herd. We will say this is 4 per cent., which is good for a herd of grade cows, but you may have some cows that test 5 per cent. fat and others that test 3. The low test is not so bad as it seems provided the cow gives milk enough. Let us see how this figures out. A cow giving 5,000 pounds of 5 per cent. milk would produce 250 pounds of butter fat. A cow producing 8,300 pounds of 3 per cent. milk would also give you prac-

tically 250 pounds of butter fat. But suppose a cow gives you only 3,600 pounds of milk, which is about the average for the cows of the country, even if this contains 5 per cent. fat the chances are that you are losing money. Even the best cow experts cannot tell by the looks of a cow what quantity or quality of milk she will give. A thousand pounds of milk in her annual yield one way or the other may determine between profit and loss. Again, many cows go dry a month or six weeks longer than they should. This often puts them on the unprofit list. Many cows leave worthless heifers in the herd which continue to eat up the profits and keep the dairyman from having some of the luxuries of life which every man in the dairy business and every kind of business ought to enjoy. So we see every dairyman ought to look to the future as well as the present and to build up his herd on a solid foundation.

Everything in these days is measured by its capacity for work, or, in the case of the cow, by her production. A man is paid, or ought to be paid, for his ability to work, either with brain or muscle. The value of a trotting horse is measured by his record. The value of a dairy cow depends upon her capacity to produce milk or butter. That is her actual value, but is that the basis on which she is valued in our dairy herds as you see them through the country? Strange as it may seem, most dairymen have no basis—old Brindle or Spot, while they may not pay their keep, have been in the herd so long that they have become old friends and their owner loathes to part with them. If we are dairying for fun, all well and good, but if we are conducting it as a business it is time the dairymen used business methods. It is not enough to know that a cow gives a pailfull of milk, when she is fresh; we want to know what she produces in a year. Dairymen have a good goal to work for in the record of the Guernsey cow, Yeksa Sunbeam, who produced an equivalent of 1,000 pounds of butter in one year, from 14,020 pounds of milk. This record was the result of careful work in breeding, feeding and all that pertains to the health and comfort of a cow.

COW TEST ASSOCIATIONS.

I want to endorse the idea of establishing Cow Test Associations. The first in this country which was organized in Newaygo county, Mich., September 26th, has now adopted a constitution and by-laws and began work October 15th. Other states should fall into line. These associations cannot fail to be strong agents in improving the milk production of the herds of the country. The various associations should get together and adopt uniform systems of keeping records so that ready comparison can be made of the production of the herds in different sections of the country. This will naturally result in competition for highest records and a desire on the part of each association to make a reputation for the section of country they represent.

The plan is practically this: 15 or 20 dairymen form an association and pay one dollar for each cow per year to help defray the expenses of the test, hire a competent person to do the work, board and lodge the official tester while at their farm, say once in two weeks, buy all the necessary apparatus and make all arrangements to have the work carried on accurately and systematically. The tester visits each farm regularly, weighs and tests the milk from each

cow, figures out proper rations for each dairyman and gives such advice as he may need. At the end of the year the dairyman has a reasonably adequate record of every cow in his herd, and he knows what it has cost to keep them, and he can easily discard the unprofitable animals.

I was interested in going through a barn a short time ago where the dairyman took much pleasure in showing me his herd, and he stated that he thought his conditions were almost ideal. While there was some improvement noted over other barns in the vicinity, such as the swing stanchions, a fairly good floor for the animals to stand on and a gutter behind the cows to permit of easy removal of the manure, on looking at the conditions more critically it was noted that there was not more than one small window to every dozen cows, that the ceiling was low, allowing less than 200 cubic feet of air space to each cow, that the mangers were heavy wooden structures with decaying feed in the corners, that cobwebs were hanging from the ceiling and the wall in the rear of the cows was coated with manure. This dairyman was willing to receive instruction and have undesirable conditions pointed out to him. He had seen but few dairies outside of his neighborhood and really didn't know that there was anything better.

THE MAN BEHIND THE COW.

Among the factors which enter into the economical production of milk, the man who handles the cow is the most important. The man who naturally likes sheep or who would rather feed steers than cows or who has not a keen interest in dairying will not produce milk economically and will not keep his cows up to their highest production. Then a man should select a breed which he likes, a breed which he is ready to advocate to his neighbors and to stand up for on all occasions. There are men who would rather have specks in their butter than spots on their stock. The man behind the cow must be a man who treats her kindly, a man whom the cow likes to have around. If she chews her cud during milking time you may know that all is well and that she is doing her best at the pail. We must see that the cows are comfortable all the time. The Kansas station in a recent test found that cows exposed to a temperature ranging from 18 to 50 degrees for several days at a time lost 12 per cent. in quantity of milk, and 11 per cent. in butter. These animals were fed three pounds more of the grain ration, but their weight was approximately the same, the loss, including feeding, amounted to \$.07 per cow per day. (There were 52 days when the thermometer registered 32 degrees below.) Accordingly, the total loss for the year per cow is \$2.24, or \$48.80 on a herd of 20 cows. We see here how much depends upon the cow.

THE MILKING MACHINE IN MILK PRODUCTION.

The contentment of the cows is very noticeable where some of the milking machines are being used that have come the nearest to perfection. I have seen a whole line of cows that were being milked with machines chewing their cuds as if nothing was going on. Where the test cups are carefully adjusted to each cow to her satisfaction and comfort and the same size used on the same teats at-

tached to the same machine with the same degree of vacuum produced by the same power, you practically have the same milker and a good milker at every milking every day. If this is not conducive to good results I do not know what is. Now while I am speaking of the milking machine, I want to say that I believe it is one of the advance steps in dairying. I have watched its workings very closely for a month and the results obtained indicate that it is entirely practical. That it is a labor saving device there is no question. For example: Two men with the machine will milk a herd of 60 cows in less time than it requires four men by hand. This makes it possible for the other two men to go into the fields with the teams early in the morning and work until evening, as it is not necessary for the drivers to take part in the milking. This is no small item, as on many farms it would amount to \$10 per week in cash and for 30 weeks a net saving of \$300.

The scarcity of milkers and the unreliability of many of them has had a tendency to keep many men from going into dairy farming. Some of dairymen who have been in the business have been obliged to give it up for this reason. Great interest therefore centers around the milking machine, especially where scarcity of labor exists. It not only requires about one-half the labor to milk the cows, but it is believed that the labor employed will be of a higher class than heretofore, and will command higher wages. It is believed, further, that the advent of the milking machines will have a tendency among farmers who now have small dairies to enlarge their plants and to make dairying their chief business. The trouble has been in the past that too many farmers have made dairying secondary to other work, and when anything had to be neglected it was always the dairy, and for this reason the profits from their dairies have been small. Where the milking machines have been introduced they have influenced dairymen to clean up their farms and to take more pride in their work. This naturally will result in the production of cleaner milk and in some cases better prices. Any practical apparatus which has a tendency to improve dairy conditions should be welcomed by the industry.

If the milking machine is not kept sanitary it will be a step backward rather than forward in the production of milk. Actual tests have shown that where the machines were cleaned by simply rinsing in warm water the bacteria in the milk drawn by them runs up into the millions per c. c. On the other hand, where boiling water or the sterilizer is used in connection with germicides the bacteria in the milk may be practically reduced to the infection which comes from the cow teats. In some cases the test has been as low as 400 bacteria to the c. c. It will be seen, therefore, that the machine offers great possibilities to the producer of high-class milk. Success here depends upon the man behind the milking machine.

The milking machine will work out in practice very much the same as the farm separator. When separators were distributed by the thousands through the West, the farmer, at the start at least, didn't keep them clean and the result was a lower grade of butter at the creamery. But when the farm separator is kept clean the cream coming from it is fully as good if not better than when separated at the factory. Success depends upon the man here again.

I believe the time has come when we should pay less attention to

the form of the dairy and more attention to her power to produce milk. It is all right to have dairy type, but production should go with it. During the past few months I have compiled some ten thousand records and secured photographs of many of the cows in each breed having the highest records. While these high record cows are not such as would be selected for their good form in many cases, yet they have the productive capacity as shown by the scales.

DEPARTMENT TRYING TO GET CLOSER TO THE DAIRYMEN.

In the earlier part of the Dairy Division of the Department of Agriculture, the main object in view was to collect and disseminate information on all phases of the dairy industry in this and other countries. Seventy bulletins have been prepared during the past ten years telling dairymen facts about the business and how to carry it on, but more recently we have seen the necessity for taking more information direct to dairymen and showing them by means of object lessons and in a practical manner how to do things. I have only time to just mention a few of the lines of work that have been taken up from this standpoint. One that promises to be very helpful and practical is the establishing of what may be termed "demonstration farms" in the South. For nearly a year a dairy expert has been traveling from place to place through the Southern states looking up the conditions and favorable localities for establishing demonstration farms. The idea is to assist in making these farms models in every respect so that dairymen in the surrounding country will have a place where they can see for themselves modern methods of the dairy management.

Another line of work that has recently been taken up and which is attracting widespread interest is the improvement of dairy barns. This is really a campaign for clean milk. The subject is of great importance from the standpoint of health when we consider that milk is used daily by almost every family in the country, and that the milk produced annually amounts to over seven billion gallons. There is no question but that there is need for much improvement in this direction. Ask the dairy inspectors through the country what they find and they will tell you that a large percentage of the barns are dark, damp and poorly ventilated, and have the odor of manure and other decomposing matter. These conditions contribute unhealthy germs to milk and keep the cows unhealthy. Since the Dairy Division began the work of improving dairy barns, letters have been received almost daily asking for plans showing proper barn construction. Plans and specifications are now being prepared by the Department architect and some have already been furnished to a number of dairymen. We hope soon to have plans drawn for types of barns suited to different sections of the country, so that dairymen in any particular section can have a plan suitable for their conditions. It is as easy and cheap to build a barn right, observing conditions which contribute to sanitation, as to build it wrong. We do not expect to reform the whole system in a few weeks but we want to help the poor farmer as well as the rich to have the best barns possible. It is hoped to soon extend the work to include silos, dairy houses, ice houses, etc.

The Dairy Division is also carrying on work in co-operation with Experiment Stations and studying problems in butter and cheese

making transportation and storage. There are many other problems which need attention, among them may be mentioned breeding for more profitable cows, questions of feeding for flavor and color in butter, regulating the amount of moisture in butter, Pasteurization of milk, etc. The Government desires to solve these problems and many others. We can accomplish much more if we have the assistance and sympathy and co-operation of your association as well as those of other states.

SOME THINGS SCIENCE HAS DONE OF LATE FOR DAIRYING.

By PROF. J. L. HILLS.

Mark Twain in his inimitable "Roughing It," tells us of a revolver which "if it didn't get what it went after it would fetch something else." Concerning it he further remarks when fired "there was no safe place in all the region round about but behind it."

Now my talk to you to-day bids fair to be somewhat like this "dismally formidable" weapon. It is a scattering discourse, and there is "no safe place in all the region round about it;" for it is aimed at the man beside the cow who milks her, and the man in front of the cow who feeds her; at the man who separates her milk, and at him who churns the cream; at the cheesemaker, at the creamery manager, and at the maker of market milk. You are all in line with its muzzle, but luckily it is not loaded with fault finding, but with facts. What I have to say breathes of optimism rather than pessimism. The message of modern science to dairying is helpful and inspiring, though it often lays upon the individual a greater responsibility because of increased knowledge.

What are some of the things which science has done of late for dairying. Let us at the outset get a clear conception of the meaning of the word science. The last generation of farmers almost to a man balked at it, and many to-day look askance as it is in no way allied to or helpful in the pursuit of their calling. This attitude seems in part due to misunderstanding as to what science is and does. Science indicates the results attained in the search for truth, grouped in such a manner as will aid in showing the relationships of these results to each other. Science, in other words, is "an orderly arrangement of well ascertained facts." The results of some lines of research may seem at times to be quite without practical learning. But we should remember, when tempted to style any such work as useless, that a notion which is derided by one generation as impracticable, or, indeed, false, often becomes an everyday affair in the next generation. For instance, the invention of photography was placed in an insane asylum because he claimed he could transfer his likeness to a tin plate; Franklin's ideas as to the nature of lightning were laughed at, and Galvani was called a fool and "the frog's dancing master" because of his study of galvanic electricity.

Science does not pretend to say the last word. It formulates theories to discard them as new discoveries lend further light. It, like practice, is ever an evolution. Hence it follows that I may tell

you some falsehoods to-day: nothing that I know to be such, yet, notwithstanding, untruths. My statements represent what I believe is held to be true to-day, but which 20, 40 or a 100 years hence may be otherwise regarded. This does not imply that present conceptions are useless, though they may be erroneous. They may prove helpful, even if they are not immutable.

To cover all that science has done even in this one line, were impossible. One must draw the line somewhere; hence I speak only of "some things" which have been done "of late." My talk on this account is disjointed rather than connected, and suggestive instead of didactic. I shall take it for granted, moreover, that you have a grasp upon certain of the fundamentals, for a dairymen's meeting is on a higher plane than a farmers' institute. It is the high school as it were of the modern instruction of the adult farmer, and consequently we may assume something for most of those who attend its sessions.

What are some of the points which have been developed touching the feeding of dairy cows?

1. The limitations of feeding standards are better understood and the protein statement of the German standard-balanced ration is under review.

2. The home-growing of adequate supplies of protein is a more practicable thing, thanks to soil if not seed inoculation with nodule-producing organisms.

3. The "best" grain feed is better known.

Professor Haecker, of the Minnesota Station is emphatic in his belief that we feed cows too much protein. He shows several animals with good records which for years had eaten only 1.5 pounds of protein daily. Five years' study at Vermont Station of the relationship of varying grain rations to profit and to bovine well-being as well as a survey of work elsewhere leads me to believe that the German balanced ration's call for 2.5 pounds of digestible protein is usually an over-loud cry. But on the other hand I am not yet ready to accept Haecker's results as applicable in the East. In fact among the later conceptions of science is found the notion that feeding standards resemble Indian rubber rather than cast-iron, that they are helpful as guides rather than as rules, and that protein is not in the slang phrase, the "whole thing." Feeding standards are differentiated into:

1. The physiological standards, which are based on animal needs and maximum production, and are couched in mathematical terms; and

2. The practicable standards which are essentially home-made, based upon and guided by the physiological standards, and which are more or less variable according to circumstances. Such a conception of the feeding standard proposition enhances their usefulness to the careful feeder.

What is the "best" grain feed for cows?

There is no best expressed in terms of pounds or measures of roughages and concentrates; but there are many thoroughly good ones. If the grain ration carries digestible protein in sufficient quantity, and is made up of three or more ingredients, all palatable, none injurious to the milk and its products, and one of them at least

mechanically a lightener of the ration—as for example, wheat bran or distillers' dried grains—it may be expected to be physiologically satisfactory. If, then a trained judgment and a due regard to economy enter into the foundation of the ration, one cannot go far astray. Five years' work at Burlington with restricted and with heavy grain rations of many sorts, as well as the study of the results of similar work elsewhere, leads me to believe that, given:

1. A class of cows making 250 or more pounds of butter,
2. Plentiful supplies of early cut hay, carrying some clover, or if it can be grown, of alfalfa hay and of mature corn silage or apple pomace silage,
3. Grain prices as they rule to-day; a six-pound ration of judiciously chosen by-products is in the long run as close an approximation to the best as we are likely to arrive at in this vale of mystery and doubt.

What has research discovered of importance to the milker?

1. An apparently successful and practicable milking machine.
2. Further insight into the losses due to incomplete milking.

I saw in December, 1904, and again last Monday, a milking machine which had now been in practical operation in a large herd for about three years, with apparent success. It is also in use in several other dairies. This machine seems simple, is readily cleaned, does not irritate the cow, strips better than does the average milker, though after stripping is advisable; is rapid in its work, but is likely to prove costly in initial expense. It goes without saying that a mechanism of this kind fills a long-felt want. If, as it would seem, its inventor can really cry "Eureka," it is a marked triumph of applied science.

I just remarked "strips better than the average milker." It is well known that the average milker gets less milk than he who does a thorough job, that incomplete milking means not only direct but indirect loss, not only an immediate lessening of the fat yield, but tends towards drying the cow. A Danish scientist has recently developed a special system of udder manipulation, a sort of massage of the mammary gland, as it were, which it is claimed augments the flow and which has a sound basis physiologically. Its conduct involves three manipulations, each thrice repeated or until no more milk is obtained; first the pressure of the quarter on each side against each other thrice repeated, followed by removal of the milk; second, the pressure of the glands together on each side, the fore-quarter first being manipulated and then the hind quarters, followed by removal of the milk; and, third, the fore quarters are pressed between hand and body, the hands holding the teats loosely, then the hind quarters also, followed by milking.

Trials of the scheme made at the Wisconsin and New York stations afforded a daily average increase per cow of a pound of milk and two ounces of butter. The "after-milk" was very rich in fat, testing about 10 per cent. This after-milking takes not to exceed five minutes' time—often less than this. The two ounces of butter may be held at a low estimate to be worth two cents. This would be a fair pay for five minutes' work, 24 cents an hour and the

skim-milk thrown in. Not only is more milk and butter made, but the secretion is stimulated and the lactation period prolonged. Similar work at the Vermont station following a good and conscientious milker were much less effective.

It may be remarked, however, that the differences in milk and butter yields between this method and careful stripping are not great. This Danish method, however, does emphasize, more perhaps than has hitherto been done, the actual and potential losses due to incomplete milking.

"What has science done for me?" asks the man who runs the separator.

Nothing perhaps to make his lot the easier, but something that may enable him to deliver better cream to the butter maker; for it has given him a more accurate means than he has hitherto possessed of detecting dirty milk, and of judging cream at the weigh can or on the cream route. This proposition is not a new one. It is nothing which the operator will be likely to adopt of his own initiative, for it spells turmoil to him; but some day it will come. A scheme of this kind seems more called for now-a-days as a cream grader than as a milk detective. Infrequent deliveries or collections and inadequate attention given the cream at the farm make decided differences in actual butter values, differences which the Babcock cannot measure. The test is an easy one. A pink tablet of alkali dissolved in water is mixed with a small measure of cream. If the fluid remains pink the cream grades 1, being relatively sweet; if the pink hue fades out, the cream grades 2, being relatively less sweet. The two creams, for there will be many lots of each, may be ripened and churned separately and paid for on the basis of returns, or a definite and predetermined discount may be made for No. 2 cream. The system is in vogue in some creameries. It's an educator; also a trouble breeder. Keep thinking about it!

Perhaps our friend the separator operative thinks his machine takes out the bacteria. He may be excused for thinking so, for does not one of the largest of the separator companies so advertise? The solid impurities are thus largely removed, but not the bacteria, according to Iowa Station's trials in which roughly one-third of the bacteria appeared in the skim-milk, one-fourth in the cream and rather less than one-half in the separator slime. Neither was it found that the keeping qualities of either the cream or the skim-milk were at all bettered as a result. As a clarifier and cleaner in the tangible dirt, centrifugalizing milk is a success but the content of dissolved dirt and bacterial dirt in the milk are but little altered by centrifugalizing.

What aid has been vouchsafed the butter maker in his endeavor to make extras?

1. Pasteurization for butter making has been popularized and made more practicable.

2. Dairy salts have been thoroughly investigated as to their purity, their mechanical properties and their comparative values.

Pasteurization has had vogue for several years. It is no new proposition, but there have been of late some points developed on which it is worth while laying some stress.

In the first place, we recognize nowadays two sorts of Pasteurization as employed with dairy products, one which is designed to destroy pathogenic or disease-producing organisms and one which is aimed primarily at those which impair keeping qualities. The first of these is meant to be a complete operation, the second, an incomplete one. Each has, however, a distinct and definite purpose. Now it is only with the latter that the butter-maker has to do. His subjection of large volumes of milk or cream to the influence of relatively high temperatures for a short time in some one of the many continuous forms of Pasteurizer improves but does not make perfect, gets rid of many but not of all the organisms. The more modern mechanisms seem calculated rather to lessen the labor and expense of handling a given volume of product than to insure the death of all of the "bugs." For the distinct purpose in view, the enhancing of the keeping qualities of the butter, this is probably an evolution in the right direction.

A recent suggestion from a Western dairy school seems pertinent. It is that the wash water should be Pasteurized. It often happens—more often than not perhaps—that creamery water supplies are not as pure, bacteriologically, as they should be. What avails it for the buttermaker to Pasteurize the cream and then wash the butter in a germ-laden water. To be sure he is not quite as apt to get so large a variety of posies in his bouquet as if he used no effort to improve the situation, but their numbers may be very great. At any rate, experiments at the Iowa Station indicate that the keeping quality of the butter was enhanced when the water was Pasteurized as well as the cream. Filtering the water through stone, sand, coke, charcoal and gravel also helps.

Dairy salt serves four purposes in butter and cheese making:

1. It aids in the expulsion of the butter-milk or whey.
2. It augments the keeping qualities of butter.
3. It serves to promote the ripening of cheese.
4. It accentuates flavor.

Nearly a million dollars' worth of dairy salt is used yearly, most of it of domestic origin. Good salt does much and poor salt does more to affect the grade of dairy products. How do the many sorts offered us serve us?

Salt is a combination of chlorin and sodium. But all salts are not all salt. Indeed, no salt is all salt, as each brand carries more or less impurity. The average American-made dairy salt carries 98.3 per cent. of true salt and 1.7 per cent. of impurities, of which 6.2 per cent. is moisture, 0.1 per cent. magnesium chlorid, 0.3 per cent. calcium chlorid, and 1.1 per cent. calcium sulphate or gypsum. The magnesium and calcium chlorids possess a bitter taste. In the quantities ordinarily present they apparently exert no ill effects on fresh butter, but they do sometimes damage storage goods. They seem to incite a slow decomposition of the butter fat. The gypsum is not only undesirable as a diluent but because it tends to cause salt to cake. Other things being equal, a salt that is relatively free from these impurities is to be preferred. Other things may not be equal, however, for the size of the grain, its shape, its apparent specific gravity and its solubility are important factors. The finer the grain, the greater its weight in a given volume and the more ready its solubility. Thus in a series of trials of fine and coarse

grained salts, the former owing to greater solubility passed more readily out of the butter during working and proved the less economical. An ideal butter salt should be pure white, of a uniform, thin, flaky grain of medium size, without ill odor, and be nearly free from the bitter salts and dirt. An ideal cheese salt may be similarly described save that the size of the grain may be larger. No one brand stands first in all these respects. "There are others" than the one you use.

Wherein has cheese making practice been put upon a higher plane by scientific investigation?

1. The phenomena of the ripening processes are better understood.

2. Canned cheese, paraffined cheese and cheese prints have been developed.

The causes of the changes brought about in cheese by the process known as ripening have been in part determined within the past few years. Up to recent times hypotheses were plenty, but facts few. It was thought that bacteria ripened cheese, but the process seems more likely to be at best but in part bacterial. It is now deemed that the natural and inherent enzymes of the fresh milk,—galactase and its associates,—and the pepsin of the rennet extract, or the scale pepsin of the drug stores which is now used in lieu of rennet in some factories, are also important factors; that all three working together are probably the main ripening agents, but that the environment—particularly as regard temperature—of the ripening cheese more than any other one thing gives character to the final product.

A number of interesting points have been brought out of late which must need be but barely referred to. The underlying reason for the hot iron test, the causes of slimy, slippery curd, of gassy or floating curds, and of "leakiness," the rationale of the quick ripening and the slow ripening cheese processes having been developed; and the relationships between temperature, moisture, varying amounts of rennet or salt, on the one hand, and flavor and texture on the other, have been determined and the causes thereof have been working out. In short the Wisconsin and New York Stations have done the cheese industry a mighty service in their abstruse, high technical work and have afforded excellent examples of the practicability of pure science.

Europeans eat cheese; Americans taste it. The consumption of cheese in this country is relatively small. It furnishes only 0.4 per cent. of the total food, 1.6 per cent. of the total protein and 1.6 per cent. of the total fat of the average American diet. There are several good reasons for this situation. One of them is the small proportion of the cheese made in this country which is put up in convenient form. The bulk of it, probably 99 per cent. is marketed in slices, cut by the pound from large cheeses, slices which fail to keep well owing to the large surface exposed to the air. A more convenient and attractive method of marketing cheese ought to increase its consumption. Canned cheese and print cheese are two recent contributions towards the solution of this problem.

Print cheese has been made for years at the Wisconsin Station. The ordinary Cheddar curd is placed in a rectangular mold and printed by pressure. Any form and size of print may be used. The

Wisconsin block contains 30 one-half pounds prints each 2.5"x2.5"x2.5", the entire blocks being roughly a foot square and 2.5" thick. It seems practicable to handle this class of cheese in the horizontal press. The print blocks cure as readily as do ordinary Cheddars, develop a good flavor and texture, and may, like butter prints, bear an identifying mark which will aid in sales. Such a cheese, if of good quality, ought to sell not only because of its novelty but on its merits.

Cheese may be canned as green curd and ripened nicely in the can. At the Oregon Station two and one-half, five and twenty-three gourd cheeses have been thus made which are without rind or mold, which lose no weight in curing, which after ripening keep for months, which stand shipment across the Atlantic and back, or to China and back, and open upon return in perfect condition. The cans are thoroughly parafined within, the Cheddar curd after milling and salting is either filled and pounded in and then put in press, being sealed the next morning; or, else, the curd pressed in the usual manner, is the next day slipped into big cans made to fit and sealed up. Cheese thus canned needs no further attention save the maintenance of a low and fairly constant temperature of about 60 degrees F. A high temperature or a variable one, particularly when the cheese is young, ruins it. Some of these canned cheeses are being made today from milk which has been inoculated with sundry aroma-producing organisms. The possibility and practicability of controlling the flavor of the ripened cheese as a result of the use of specific bacteria has been demonstrated. It looks as if in the near future special brands of canned cheeses of guaranteed quality, of specific and excellent aroma and flavor, in specially labelled cans, cheeses without rind, every bit edible, well ripened, of friable texture, in short, a delicate and superior product will be offered to the retail consumer. It looks as if this might solve the family trade difficulty and promote the use of this valuable, digestible, concentrated and under-used food.

Cheese of the Cheddar or stirred curd type, dipped in paraffin at temperatures from 180-250 degrees F., for a moment, and allowed to drain a few seconds, is coated thus with an airtight, impervious coating which lessens the loss of weight in ripening, prevent the growth of mold, improves its appearance, and lowers the proportion of rind from about 12 per cent. to 3 per cent. So far as observed, this in no way interferes with the ripening process or deteriorates the flavor or the texture of the cheese. This modification of the process seems particularly adapted to the cold cured goods which are to be the coming cheese.

Has science done anything to make the factory manager's job more of a bed of roses?

Not that I am aware of. It has, however, added to his information. It has shown him the injustice which he is often doing his cream patrons in not weighing the cream samples prior to testing. It has indicated some of the errors that are resident in careless methods of sample taking and handling. It has, however, for his comfort, vouchsafed some explanation of the great variations which may naturally occur in milk and cream from the same dairy,—explanations which no doubt do not always satisfy him whose test drops, but are not withstanding fairly satisfactory explanations.

"What makes the milk test vary so?" is still a burning question, though less so than it used to be. I sometimes wonder whether it is because dairymen understand it better, or because they are hardened to it; whether more accurate sampling and testing and better informed operators and superior mechanisms have lessened the proportion of incorrect testing, or, whether the judicious use of a lead pencil in the office "evens things up." I do not know; but this I do know; that any intelligent farmer who wishes can own and run a Babcock and determine the truth for himself if he is careful and informed, but not unless he is careful and well informed.

May market milk be bettered by aught that science has done for dairying?

Yes, for now are better understood than of old:

1. The principles underlying stable ventilation and the causes of its failures.

2. The sources whence are derived the organisms which cause annoyance, loss of products or disease; also how to avoid the damage they do.

3. The dangers of "doping."

The topic of stable ventilation is one which is often ventilated. Since much animal disease is due to or its spread promoted by the housing of cows in ill ventilated stables, it is a dollar and cents proposition to try and better this condition. Too little oxygen and too much carbon dioxide; too little air, too much exhalation from lungs, skin, manure, etc.; these are conditions which augment the growth of disease germs and impair vitality. A cow needs hourly 3,542 and a horse 4,296 cubic feet of air, amounts which fill a space ten feet high, ten feet wide and 35 to 43 feet long. Theoretically, perfect ventilation is neither practicable nor necessary; but the conditions may be better in many barns.

Every barn is a problem unto itself, because of differences in shape, in distribution of contents, in contour of land in its vicinity, in the relationship of its structure to the direction of prevailing winds, as well as in the number, location and character of animals, etc. However, some of the principles which have been worked out are suggestive and helpful. These are:

1. Entrance of the fresh air near the ceiling of the stable by an indirect line, or by conduit into the barn near the cow's mangers.

2. Removal of the foul air from points near floor or near ceiling, either exit to be available as needed.

3. As straight, tall and simple a stack (ventilator) as practicable; as few angles as may be in side shafts; no horizontal lines whatsoever. In fact a good ventilating shaft should be as near an approximation to the form of a chimney as is practicable; should be airtight, should rise high above the roof, be located as near the center of the stable as may be and should have a liberal cross section. It is a good notion to sheathe a metal ventilating flue with wood and to use building paper on a wooden one. A chilled chimney does not draw well; and the chilling of a barn ventilating flue seriously impairs its efficacy.

It has long been known that the fodder and the bedding, the exterior of the cow and her milker, the utensils and the dairy, were all sources of the bacterial contamination of milk. It has been taught until recently, however, that the cow herself, if healthy, was not

guilty; that her milk as it was drawn from the udder was free from micro-organisms if the fore milk was rejected. This is known to be not quite true. She does contribute a small quota to the general assemblage; and all the cleansing of barn, and dairy, and occupants will not avail here, for we cannot cleanse the inside of a cow's udder. But we may deter almost all of the bacteria from entering the milk after it leaves the udder.

There are three ways of fighting the bacteria in milk.

They may be kept out.

They may be killed out.

They may be caused to commit race suicide.

Exclusion, destruction, isolation! All good—but the best way and one not of necessity expensive is so far as may be to include them.

Now I do not mean again to rehearse the story of cleanliness in the dairy. Its an old story, and folks are tired of it. I do want, however, to say a word or two about the sanitary milk pail.

Much of the dirt which gets into milk tangible and intangible, visible and invisible, that which may be seen on the cheese cloth strainer, and that which dissolves and passes through—dandruff, hairs, flecks of dried manure, bacteria and the like—fall into the milk from above during the process of milking. Now straining milk through cheese cloth only removes a part of this material. The situation can be bettered to a marked degree, the keeping quality of the milk be enhanced, and the likelihood that the milk will make good butter be increased by attention to a few details that are neither costly in money or time, nor difficult to install.

1. Wipe udder and abdomen with a slightly damp cloth immediately before milking.

2. Provide milkers with clean clothes for use at milking time.

3. Fill the seams of dairy utensils with solder and use some form of the sanitary or dirt-excluding milking pails.

There are several forms of the latter. One is a covered pail with a 4 inch funnel covered with wire gauze into which fits a loose ring whereby may be fastened in a few layers of cheese cloth. Another is a closed pail with a large opening covered with a wire mesh, cheese cloth and absorbent cotton. And still a third and very practical pail is one with a shoulder and a hood, or visor, which is otherwise open. According as this is held the amount of dirt entering the pail may be cut down from 60 to 90 per cent.

If now after the bacteria have been thus excluded their growth and multiplication are checked by low temperatures, one may feel fairly certain that the milk will have a lease of life almost as great as that of a ton of coal during a cold wave.

Doped milk is one of the dangers of the market milk trade, one of its great temptations. What is science's latest say-so as to embalming processes?

Dr. Wiley of the U. S. Department of Agriculture has contributed the first piece of positive information we have had on this subject. Claims and counter-claims have been made as to the harmlessness or harmfulness of chemical preservatives. He, however, is in a fair way to settle the matter by direct experimentation with his "poison squad," a lot of young men of vigorous health to whom under careful restrictions and constant medical supervision the borax compounds, common preservatives, have been fed. Without going into

details it may be remarked that it has now been amply proven that considerable quantities of borax or boracic acid are inimical to digestion and to health; that minor quantities are more or less so though at times, perhaps, not injurious to healthy adults. These preservatives are undoubtedly less dangerous than are the ptomaines which may form if the materials remain unpreserved, yet they do not form when care and cold are used. Science has put its seal of disapproval on the use of preservatives unless the existence thereof is advertised on the container of the goods.

I have taxed your patience for a long time, yet I have only outlined a few of the many relatively recent contributions of research of dairying. If you would know more of them, would study any phase of the subject, ask and I will gladly direct you to literature if I am acquainted with it.

Now with what exhibition of oratory and rhetoric shall I close? A preacher having talked long and prosily to a lot of children, finally said: "Now, little folks, what more can I say to you and do for you?" A little lad in the front row piped up, "Say amen and set down." "Amen" means "so be it;" and so most heartily to everything science and practicable that makes for dairy advancement say I "Amen"—and sit down.

JOINT SESSION OF PENNSYLVANIA LIVE STOCK BREEDERS' ASSOCIATION AND PENNSYLVANIA DAIRY UNION.

Pittsburg, Pa., January 17, 1906, 7.30 P. M.

The CHAIRMAN: We will now listen to the Hon. N. B. Critchfield, Secretary of Agriculture, who will give us a short talk.

ADDRESS.

By HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

Mr. Chairman, and Gentlemen of this Union Meeting: I went to a great deal of trouble to get here this evening. I have been very busy for the last few days, and it was quite an undertaking for me to get here at all, but I wanted to come, if I could only be present at this joint session, and in order that by my presence I might be able to assure you of the personal interest that I feel in the work you are doing, and the interest that the Department of Agriculture of the State of Pennsylvania feels in what you are doing, what both these organizations are doing for the agriculture of the Commonwealth of Pennsylvania. There is another reason, Mr. Chairman, why I was especially anxious to be here to-night, and that was in order that I might have the pleasure of meeting, and not only meeting but hearing, the distinguished gentlemen whom you have brought here from other states.

The work that you are doing in both these associations is very nearly related to the work that is being done by the Department of Agriculture of the State, and especially is that true just now. You are engaged in the improvement of the dairy interests of the State as well as the live stock of our Commonwealth, and our Department has been engaged for the last few weeks especially, in the work of trying to provide better feed upon which the live stock of the Commonwealth shall subsist. You may know something of what we are doing if I tell you that since I left the State Capital on Monday evening I have attended no less than fifteen hearings, that resulted from prosecutions brought against persons for violation of our feeding stuffs law. This work of prosecution was delayed for a while for the reason, for two reasons, I may say; 1st, because we did not feel like entering upon it until we had our chemical laboratory thoroughly established, and well equipped at the State Capital, so that there might be constant intercourse between our chemist and the head of the Department; and second, for the reason that some changes were made in our feeding stuffs law by the late legislature, and it was thought proper to give the people an opportunity to obtain a knowledge of the law. The application of the term "commercial feed stuffs" by the last amendment, was extended, and liabilities of dealers were increased considerably. In order that some people might have some knowledge of the law before prosecutions were begun, we determined to wait until three months had elapsed, and during those three months we were trying to inform the manufacturers and dealers throughout the State of Pennsylvania what the requirements of the law are. Printed copies of the law and the amendment thereto were sent out to all the dealers whose addresses we could secure, and circulars explaining the law were sent to all the newspapers of the Commonwealth with the request that they be published for the information of the people, and it was determined that prosecutions should begin, in fact, Mr. Chairman, we hoped by publicity perhaps we could do away with the necessity of any prosecutions, but we determined, if giving publicity to this matter would not do away with the necessity of prosecutions, they should be begun soon after the first of August, and we would begin to prosecute wherever we found violations of the law by dealers from whom samples were taken on the first of August and afterwards. And we have had quite a number of them to bring, so we have been very busy, and in this work we are working especially along the same lines that you are working.

Now, I did not expect to make a speech when I came here; but before leaving the floor I want to congratulate the members of the State Live Stock Breeders' Association and members of the Dairy Union upon the excellent prospects that seem to be before you. I do not know that there was ever a time when prospects for the men engaged in rearing live stock, and especially breeding the better class of live stock, than there is at the present time, and you know that the market price for dairy products, has been holding up remarkably well during the past year. There has never been a time since the creation of the Department of Agriculture when there was such a very great demand for licenses to manufacture and sell oleomargarine and renovated butter as there has been within the last few weeks. Now, we do not care about seeing very much of this

stuff manufactured or placed upon the market, but our law provides it shall be done if it is done according to the laws of the Commonwealth under a license that is granted by the Department of Agriculture, and the reason why I mention this is an indication that the price of dairy products is holding up well. The people who manufacture these imitations of dairy products, of the genuine article that is manufactured at the creamery and upon the farm, are wide-awake people, and they would not be asking for a license to engage in this business unless they felt there was a very good prospect before them.

With regard to the live stock interests, it seems to me that the prospects for the future are very flattering indeed. The year just closed has been one of the best years that I have known during the period since the period immediately after the Civil War. The live stock sold in the City of Chicago, and what is done in Chicago, by the way, is a very good index to what is done throughout the whole country so far as the live stock is concerned, the live stock that were sold in Chicago during the last year were sold for \$36,400,000 more than was received for live stock during the year preceding. That is certainly a very large increase. The demand for horses, especially, has been remarkably good during the last year. Those of you who have been watching the market have not failed to see that good driving horses, horses well mated, well-bred, well-trained, that have good style and good action, have been selling readily from eight to twelve hundred dollars per pair, and the same improvement is true of heavy draft horses. So that those of you who are engaged in raising horses have a very excellent prospect before you. And the same is true of the cattle trade. You have noticed, perhaps, as I have, that there is an inclination in recent years towards the purchase in our market of what is called baby beef, cattle being slaughtered younger than they used to be, and this perhaps is owing to the fact that we have a larger population in our cities who want a good home dressed beef that is reasonably tender, without knowing that it has been placed in cold storage and ripened for two or three months before it has been placed upon the market. This, no doubt, is one reason why we have this demand. Another reason, perhaps, is found in the fact that they have come to understand better than they have done in the past, that the most money is made in feeding stock, by getting it into the market just as early as possible. The young animals are growing, you know, much more rapidly, and much more weight can be made with the same amount of feed given to a young animal than given to one that is older. You take, for example, a calf that weighs 100 pounds at the beginning, by careful attention and proper feeding the weight can be increased from eight to ten hundred pounds the first year. Every one knows if that calf goes beyond 400 pounds in the increase in weight of the animal for the second year, it is doing very well. We all know that much larger amount of feed is consumed the second year than the first. The older the animal gets, until the period of growth is ended, the less will be the increase in weight, and after the growth of the animal has been completed the gain will be still less. So the feeders have come to understand that if they want to get a good price they must get their stock into the market just as early as possible.

Now, the point to which I wish to come is, that these ends can be

secured only by having the best stock to begin with, the best blood, and hence I say there is a very bright prospect in the near future for those of you who are engaged in breeding, in producing the very best stock for breeding purposes.

Now, Mr. Chairman, as I said at the outset, I do not expect to take much of your time. I know that you have your program and that every moment of your time is precious. But it has afforded me great pleasure to look in upon you, even though it be for this one session only. I must return tomorrow to the work at which I have been engaged, attending hearings in other parts of the State, so that I only hope to be with you at this session, but I am very glad indeed to have been here, and it has been an inspiration to me, it is an inspiration to me, to look into your faces and to see men such as I see before me, earnestly engaged in the work in which you are engaged. I will return to the work of the Department better qualified for that work because of the opportunity of meeting with you here.

ALFALFA IN THE EAST.

By MR. WILLIS O. WING, *Mechanicsburg, Ohio.*

Mr. Chairman, and Gentlemen: It gives me great pleasure, and I feel it is one of the great honors that has happened to me, to talk to a body of men like this. I have attended a few meetings, and I do not think I ever looked into the faces of as able a lot of men. I want to say right now, gentlemen, that I am not a speaker. My brother is the speaker. I have just come down here to tell you a few truths about the alfalfa plant. I will try to confine myself to the truth, and maybe if you do not get a literary treat you will get some real good out of it.

Gentlemen, if you went into a field of clover and you knew that it represented eight tons to the acre; if when you got through cutting your oats and piling the sheaves, you knew that it represented 160 bushels to the acre; if when you looked at that field of corn, you knew that it represented 120 bushels—as we speak of bushels in Ohio—if you approached crops like that, which meant that amount of wealth, and it had been established by the traditions of your state and your farm, when you approach a crop like that, then what would your feelings be? Gentlemen, that is the sort of crop I have to present to you in the crops of alfalfa. Now, those sound like strong figures, but let me make that a little clearer. We raised there at home on our land about four tons average per acre on about a hundred acres. We raise no better than our neighbors, not as good as some a little ways off from us. We are able to trade this alfalfa very nearly pound for pound for ear corn. Figure for yourselves, and see how much corn I can buy with an acre of alfalfa. I can buy just about two acres of 60 bushels of corn as we speak of corn. You may say that this alfalfa is a new corn, that it may have this value now, because we have been able to dupe some people into selling it. But I want to say to you that alfalfa has an intrinsic value. I have

heard it said of spring barley that it is meant to sell and to start alfalfa with. Alfalfa I would say has an intrinsic value. I will show you it has an intrinsic value when I come to measure it. I was talking with a man this morning who raised this year probably 200 tons of this hay. I asked why he didn't sell it and buy some clover to put in the place of it. He said, "No, I wouldn't care to do that. I wouldn't make anything by it." I don't know of any fellow who is a closer figurer than your hired hand. One of my neighbors recently had a hand. He said to him, "If you want some hay, I have some clover hay which you can have at \$6 a ton, and I have got some alfalfa which you can have for \$12 a ton." The hand said, "You don't fool me, I will take the alfalfa." He would have been inclined to take the clover if he hadn't thought he was going to get a little more than twice the value. I wouldn't let a man bring to me two tons of clover and take away a ton of fine alfalfa hay for a fattening ration.

Now, if you will look at the values according to the analysis, they wouldn't be in that ration, but in a fattening ration I want to call your attention to one thing. A food that has \$4 worth of food value to the ton to my notion would not be worth much more than half as much as a food that had \$6 worth a ton. I don't know, it may be a little bewildering for me to present that in that way, but now, for instance, alfalfa is given at about \$9 when clover is worth about \$6. But in a fattening ration I don't believe that will work out. As a maintenance ration, I think that perhaps it might if they are equally good. The point I am trying to make is, the ration of lower value burdens the animal. For instance, corn fodder would show an amount of food value probably say three dollars a ton, but you could not fatten an animal if you were to give him ever so many tons of corn fodder. You could not give him enough pounds. I think you get my point.

Alfalfa has a fertilizing value. It has a mechanical value as a subsoiler. The roots go way down maybe six, eight, ten or twelve feet. I have seen them five feet the first year's growth. When it is plowed it leaves that soil with little capillaries running down. It has a value in that it adds some organic matter as the clover root does. It has a value as a nitrogen-gatherer with all of the other leguminous plants. I suppose that from an acre of alfalfa, from what the Dean over at the University said the other day, if you fed the stuff back on to the land, and would add to that the nitrogen of the soil that you get from an acre of it, you would put on to that soil about \$25 worth, taking it at the price at which you buy nitrogen. We have fed this hay to lambs. We fed 1,400 lambs and 100 head of fine sheep at home. I will say to those of you who are lamb feeders, I have been able to double the weight of the lambs in a period of six months' feeding about two bushels of corn, and what alfalfa hay they would consume, and when I say consume, I mean practically all of it, because we throw out nothing from the racks but some stalks.

Now, then, I come to the question whether alfalfa can be grown in Pennsylvania. I want to say for your encouragement that some who have tried it in Ohio failed. One of the men over there who tried it was at the college one time, another was the State Experiment Station, and all the agricultural papers and lots of our neighbors

said: "Well, now, you can't just grow it. That is all there is to it. You might just as well shut up. You can't grow it here." They said it wasn't the natural place for the plant. But we are growing it, and within a radius of fifteen miles of our home, we produced three thousand tons last year. We fooled with alfalfa for ten years, and were very much discouraged, and I want to say to you, you find out one thing if you have ever tried it on a piece of ground and did not succeed and plow that up and re-seed it, that you succeeded much better than the first time. That is practically on account of three things, one of which, there is something in inoculation, and there is added some fertility; and further, it has put the ground in better mechanical condition for the following crops. Where we are growing it in Ohio we are doing it on a variety of soils in the glacial drift—I don't know that the glacial drift has any peculiar significance—but we are in the glacial drift, and we thought at first it was best on alluvial soils, and tried it on that soil, and then we thought we could do better on gravelly soils, and we have finally come to grow the best alfalfa on heavy white clay lands, and on yellow clay lands, lands that were formerly considered pretty poor lands. But there is where it is doing the best to-day since we have got stands of it. You cannot grow alfalfa, to begin with, on a shallow soil, that is a soil where it is only twelve or fifteen inches to the bed rock, in our country, for the reason that it will freeze out in February and March, it will heave out of the ground, but there are not, I suppose, very many soils like that in your State. Mostly you would have a depth of from three to eight feet. We grow it on even pea soils there at home with the addition of some muriate potash. My brother told me that the keystone of the situation in Pennsylvania is lime. I do not know that it is, but if you put lime on I wouldn't fool with it, I would put enough on. It is not very expensive, and put on about 300 pounds to the acre, and put it on in almost any form.

Now, then, to come right down to alfalfa. To grow alfalfa in any state, there are two or three things that are necessary, and one is a dry soil. To grow alfalfa successfully on my farm we had to put in 320 acres about 14 miles in tile drain. That is a synonymous term for sweet soil, and it is not sweet everywhere. You must have a sweet soil, and the lime will make it sweet if it is acid. Last, but not least, you must have some humus in that soil, and preferably some manure on the lard. Now, I do not mean by that you must always have a rich soil. We have alfalfa growing finely on land that was just a white pipe stem clay, but we stimulated it. First we coated with manure, we stimulated the plant until the roots get down to the subsoil.

A Member: How long do they stay on that soil?

MR. WING: Twelve years. That is, possibly getting better up until about the eighth year.

Now, then, about our process of seeding. We plow the ground early in the spring, or late in the winter if we can, and plow it a little deep so it will turn up some fresh dirt. Then early in the spring as we can work the land we go in there and seed the ground nicely with seed, about 15 pounds of alfalfa seed and about a bushel of beardless spring barley. That is what it is useful for, to give a stand of alfalfa, and it is the best nurse crop.

A Member: Why not any barley?

MR. WING: I am not acquainted with other barleys, but this beardless spring barley is short strawed, early maturing, beardless and matures with wheat. The other method would be to seed without a nurse crop, except if you are pestered with crab grass. Do you know anything about crab grass in this State?

A Member: Yes. We have some in the eastern part of the State.

MR. WING: Where you are bothered with that, plow as suggested, early, and disc along until say June or July even, and then seed at the rate of fifteen pounds per acre by itself, or if you had a season like this I wouldn't see why you couldn't plow up a clover field or oats stubble too and seed after those crops. Whether you seed with a nurse crop or without, it will be necessary the first year to clip the weeds off if the weeds appear. Rake them off. The first year it won't look like it is going to amount to anything. When the fall of the year comes around do not be tempted to pasture it the first fall. Let it have all its growth; it will be much stronger. Let it go through the next winter and next year the hay will pay you for keeping the stock off that first year.

Another word about seeding. In selecting your seed, darker seed is an indication that the seed is heated in the stack or after it is thrashed some time. Select the bright yellow seed and if a few green seeds should appear in it that does not hurt. It merely signifies that the seed has been grown in the northwestern rather than in the southwestern part of the country, and the notion is the northwestern seed should be the better seed. I do not think you will notice any difference, but it is just as well to be on the safe side.

I have got conceit enough to think I can come here into Pennsylvania and raise alfalfa. I may be wrong. Now, I just want to tell you a little bit of what alfalfa has done there at our place. About fifteen years ago the gross receipts of our farm were \$800. When we started to feeding lambs we were able to fatten there about a single deck load. Then we got a double deck load, or about 250. After we fed the 250 carefully saved all that manure and put it back on the place. This winter we are feeding 1,400 lambs and a hundred head of fine sheep, and cows and horses that go with the place, on the same amount of land that fifteen years ago produced a net revenue of \$800. In addition we have sold 150 tons of hay off the place. If you desire to ask any questions I will gladly answer such as I may be able.

A Member: Can you tell us anything about alfalfa meal, manufactured as concentrated meal?

MR. WING: I cannot tell you anything you probably do not know now about alfalfa meal.

A Member: You say your lambs doubled in weight.

MR. WING: Yes.

A Member: How heavy are they when you get them?

MR. WING: From 42 to 52 pounds.

A Member: Have you had any experience with the so called alfalfa culture?

MR. WING: We believe in inoculation. But it does not sound reasonable to me, gentlemen, that if you had a piece of land with all the life out of it that you could inoculate that soil and expect the bacteria to live. What is the best place to make them thrive? Disease bacteria thrive where there is some filth and I believe that if you would thoroughly manure the land where you intend to raise alfalfa the bacteria will ultimately take care of the situation. You will introduce a few with the seed. However, if you want to inoculate that soil, I do not think you can hurt it at all. I believe that you would get pretty close to the same result without inoculation if your soil had been manured. Where it was manured I never failed to find them almost at once, and quantities of them.

A Member: Did you ever inoculate the soil by introducing soil from other fields?

MR. WING: No sir, when we commenced growing it out there at the farm there was not much said about inoculation. I think if we had known more about it at that time perhaps we might have been benefited somewhat, but we didn't have the amount of stable manure then that we have now; nor did we realize the importance of it.

A Member: How many crops do you usually aim to get without plowing up and reseeded?

MR. WING: I am trying now to get the farm into a systematic shape. I follow corn with corn. This year I got 72 bushels of corn (144 measured) on the alfalfa side, and 68 bushels on the old ground. So it is two years in corn; and then a year in barley and alfalfa, and then three years more in straight alfalfa. This makes a six-year rotation.

A Member: Do you cure your hay under caps.

MR. WING: No, sir, we haven't got that far yet.

A Member: Tell us how you harvest it.

MR. WING: It is pretty hard to describe. The weather enters into it so much, the conditions vary so, but I prefer to make it mainly in the swath, that is the first crop. But you might have to let it lie a couple of days if you are having bad weather, and just as soon as it gets dry for half way down, start the rake in there and rake it into small winrows and turn the green side up. When that green side is dried properly, get it into the shock. Putting it into shock depends upon the weather. Sometimes be ten days or two weeks before we get it into the barn.

A Member: You mean let it wilt and pile it up?

MR. WING: After you come to throw it out it seems like it gets in a sweat and loses moisture very rapidly. On the second and third days it is a different proposition, about such a proposition as to make clover. We don't use a tedder for the reason that the leaves come off very readily. I believe there is a form of tedder that won't do

that, but the old fashioned kicker that we had would knock the leaves off.

A Member: Do the roots bother the tile drains?

MR. WING: Yes, if you get tile running through your field, that is a field with running water throughout the entire growing season, it will be better to leave that strip of ground over the tile without any alfalfa. We had a hundred yards of tile filled. We have about 14 miles of tile there on that farm.

A Member: Would you advise paying \$20 a ton for the alfalfa meal?

MR. WING: No, I do not believe I would. What would you want to use it for?

A Member: Feeding dairy cows.

MR. WING: I do not believe there would be any advantage to dairy cattle to have it ground. Your dairy cattle will eat it all.

A Member: It is not on the market in any other form.

MR. WING: No, sir, unfortunately it is not on the market very much yet, but it will be. I believe that Ohio is going to raise a lot of alfalfa hay.

A Member: Would you pay \$20 for it if bran was the same price? And if the alfalfa were put in the same mechanical condition that the bran is in, would it, in your mind, be a substitute for bran?

MR. WING: Yes, I would not hesitate to say that alfalfa will make a substitute for bran. I will tell you what I base my assumption upon. One or two years we fed lambs on shredded fodder or with clover hay and bought bran, and my bran bill was something huge. I gave them what bran they would consume. Also I have had quite a little experience feeding bran to our fine sheep, and we just about get our bran bill out, and my gains with alfalfa and no bran are as good to-day as they were ever, I don't know but a little better.

A Member: The advantage of grinding the alfalfa is to put it into the same mechanical condition that bran is in, and to save the cow that work.

MR. WING: The cow hasn't anything else to do. I would think it would be cheaper to buy the hay.

A Member: If you could get hay and bran at say \$20 a ton and ground alfalfa at \$20 a ton also, which would you take?

MR. WING: Well, that would depend a little on what kind of alfalfa that was ground. If it was damaged alfalfa I would prefer the bran.

A Member: Supposing it was first-class?

MR. WING: According to analyses there is not very much difference, and according to my own experience in feeding there has not been a great deal of difference.

A Member: You mean alfalfa hay ground up?

MR. WING: Yes.

Member: Nearly equal with wheat bran?

MR. WING: Yes.

A Member: Is that the whole stalk or only the top that is ground?

MR. WING: The entire plant. My lambs do not discriminate about stalks as they do about the clover. I will give you an illustration of the value of alfalfa. We have some clover this year on some land that we bought that we thought was not rich enough to raise alfalfa on, and we had been feeding that clover to one bunch of lambs; two other bunches of lambs were fed on some very badly damaged alfalfa. We had a great deal of rain at the time of the first batch of hay last season, and the alfalfa stood there in shocks until when I went to open it out it smelled, and there were traces of mildew in it, and it looked like manure when it was wet and soppy. I felt pretty blue. We had probably 45 or 50 acres of hay in that condition. But we opened it out and got it dry, and it looked better, and I put the best of it in the barn and the worst of it in the rack. I have been feeding some of the worst of that hay to one bunch of lambs, and some pretty good clover to another bunch up to the first of the year. With the clover-fed lambs I had my brother feed all of the corn they would take in the ten weeks, and now, we didn't weigh these lambs when we put them in the feeding, but if you know the western lambs you will know they run uniform. The alfalfa-fed lambs were about 5 pounds heavier than the other lambs that had all the corn they would consume.

A Member: Without corn?

MR. WING: Without corn and with damaged alfalfa. That on my bunch of lambs means over \$500 if it had been fed throughout. They ate that damaged alfalfa almost all of it; threw out very little. And with alfalfa hay, as we ordinarily raise it, we do not throw out anything and make good gains. I think any of you will concede that.

A Member: Do you think you know how much a lamb gained in ten weeks?

MR. WING: Well, in the ten weeks they gained, one bunch, about five pounds, I presume, and the other ten pounds. The first period, you know, frequently up until Christmas, we do not expect to get much if any gain at all. We get the weak western lambs, and then after that period you begin to get the gains after they get a good start.

A Member: Starting an alfalfa field in Pennsylvania, the first year seems to be a general failure. Would you put it right back on the same ground and inoculate?

MR. WING: Let me give you another suggestion. I have talked to a number of you. Why don't you mix your clover and alfalfa say

half and half for a year or so. That will help to inoculate and there would be something to do, and they don't quarrel at all.

A Member: Do you use commercial fertilizer?

MR. WING: No, have'nt used over 4 tons in fifteen years on the farm.

A Member: Do you use common clover as a nurse crop?

MR. WING: No, I wouldn't. For a nurse crop I said we had barley the first year, and seeded without a nurse crop along later in the summer after discing the land.

A Member: Do you sow on a wheat field?

MR. WING: We sow every way. You can sow on a field such as a wheat field and your land should be plowed and it must be disced. The seed must be put in the ground.

A Member: How do you sow it?

MR. WING: We ordinarily sow with a drill and let it go in front of the drill holes. Just put it in the grass department and let it go in front of the drill holes so that it will become covered slightly.

A Member: Do you pasture?

MR. WING: Yes, we pasture it with all kinds of stock. There is a little danger in pasturing cattle or sheep. It may be done, but I think here in Pennsylvania you would be safer to pasture with the cattle and sheep. They are pretty valuable here. With hogs or with horses there is no danger. I wouldn't pasture at this stage very much while you have the difficulty you now have in starting it, because the tramping of the ground is not good for it. It will not do at all. I believe I wouldn't pasture very much until you get a better stand.

A Member: Do you allow the nurse crop of barley to get ripe?

MR. WING: Yes. Sometimes sow oats and cut that for hay, but oat hay is one of the hardest kinds of hay I know of to cure; it is likely to be neglected and if it goes too long it will not do right. I believe I would just use that barley first, or else cut out the nurse crop.

REMARKS BY GOVERNOR HOARD.

This alfalfa question is a big one. I have been growing alfalfa in Wisconsin for ten years. Indeed it might be said, like Mr. Wing, that I was the pioneer of it in that state. It had been tried in a fugitive way here and there by men who said it could not be grown. I found on a farm that was near me roots that were thirty years old. I thought that would answer sufficiently. I believed I could grow alfalfa if I knew enough about it. I readily saw that in that climate it had to be handled with peculiar understanding. For instance, we get the mercury 40 degrees below zero. I took about 25 or 30 city lots, varying in all kinds of soil from a blue clay residuum sub-soil, black soil, up to sandy soil. Heavy clay, clay 30

feet deep, tried all kinds of soil, and had a great many failures, and welcomed every failure as much as I would a success, because it taught me as much, and I finally formulated a method which I want to say has proved eminently successful. Prof. Henry at our experiment station said, "Hoard, I don't think you can succeed." The whole of the agricultural college thought I couldn't do it, but I did it.

The result of it is I put 180 tons in my barns last year from 35 acres of land.

Now, a few things about what I do with it. For instance I was feeding ordinary hay to my herds of Guernsey cattle and eight to ten pounds of Ajax flakes and bran with 36 pounds of good field corn ensilage that would go from 90 to 100 baskets to the acre. When I put my cows upon alfalfa hay, ten to twelve pounds, they continued in that way for two weeks. They increased their milk flow and I put the manure under a magnifying glass and I made up my mind I was throwing away grain. I reduced the grain ration, and the milk flow held; and I reduced it until I cut the grain ration squarely in two, and it saved me 50 per cent. of my grain ration. It is worth that much in making milk. So that 35 pounds of good field corn ensilage with the corn in, and ten to twelve pounds of alfalfa hay, particularly if it was the second and third cutting, will almost complete the ration, needing say about 3 pounds of bran and a pound of gluten or three pounds of bran and two pounds of ground barley to the cow. Now, those cows did this last year. The whole herd averaged, and they were not fed any more than from the 15th of May until the 15th of October, they averaged 6,750 pounds of milk, and made within a fraction of 400 pounds of butter per cow. That was the result of feeding 35 pounds of ensilage and 10 to 12 pounds of alfalfa hay, and the ration of grain I told you. It cost \$32.60 per cow and \$6 a year for the pasturage.

Another thing I do with alfalfa. I have three field teams of horses. I fed the alfalfa hay, first cutting, just the coarsest, for the winter keeping of my horses on eight ears of corn a day. My horses are fat on 12 pounds of alfalfa and eight ears of corn a day. So much for horses. My brood sows from the time they are served until the time they farrow are fed on nothing but their drink and alfalfa hay. A party of gentlemen from the university on Saturday last came over from the classes and they said to me that they had heard that I kept my brood sows on alfalfa hay during the period of gestation, and I said, "Yes." "Well, we would like to see the hogs." I took them into the hog pen and showed them the sows. And they looked at me in blank amazement. "Why," they said, "these hogs are in good condition." "Yes." "And they get nothing but alfalfa hay." "That is all the nutriment they get except their drink."

A Member: Was that hay cut?

GOV. HOARD: Yes, sir, second and third cuttings.

A Member: What kind of drink do you give them?

GOV. HOARD: Their drink is mostly water, no whiskey I assure you. It is rarely ever they get milk—28 calves taking the skim milk. But you will be perfectly amazed, you can keep hogs all winter on nothing but hay and what water they need.

A Member: Do you cut the hay? Steam it?

GOV. HOARD: I only cut it in the fall.

A Member: Do not chop it?

GOV. HOARD: I steam it, throw it into those hogs; as the old Irishman says, "Indade, man, but they ate it like a baste."

Now, that is what led me to do that thing? I ran across a bunch of hogs in Colorado that weighed 178 pounds per hog when they were eleven months old. After they were born they staid with the mother five weeks; when they were turned on to alfalfa pasture, and the little things, as they were, went to grazing on alfalfa. They were wintered on alfalfa and sold when eleven months old weighing 178 pounds apiece, never saw a spoonful of grain in their lives. They wintered at an alfalfa hay stack. I said to myself, there is something in this thing. In the West we had a great deal of trouble with our sows. In farrowing, the pigs would come weak, lose a good many pigs, and we grow an abundance of corn there, and do you know, corn is one of the most deluding and debauching things in the world. Well, now, then, I reasoned that the difficulty with these pigs is that the mothers did not get protein enough to make those little bodies during the period of gestation, and the result of it was that when they came they were deficient in strength and vigor. The first time I tried this system of feed in the brood sows on alfalfa hay was five years ago. My foreman, when I went to Texas—to El Paso to spend two or three months—the foreman was just frantic about it and he says, "I hate to let you go off with such an order that I cannot feed those hogs any grain." "Well, now," I says, "I am going to stick right to it. I don't want you to feed them a spoonful. I don't care if I lose the hogs, I want to know about it." "Well," he says, "they will be perfect skeletons, I know." A month rolled by and he wrote me, "The hogs are not losing in weight." The next month came by and he says, "I think the hogs are gaining a little." I was suspicious. I wrote back to him, "Are you feeding any grain?" "Not a spoonful. I stuck to what you told me." The pigs came and from that time on I have never had a single weakling pig where the sows ate alfalfa and were kept on alfalfa during the period of gestation. It is one of the most wonderful plants I have had any experience with. We found that the old monks a hundred years ago at Pueblo planted alfalfa and I have seen the roots which the people say were from the same old roots that were planted by the monks, and still it is just dawning on the intelligence of you and me. This plant called alfalfa was known to the old Germans under the name of Lucerne. They abandoned it when they came to the country. In Jefferson county where I live, eighty per cent. of the people are Germans. I got hold of an old German one day and asked him if he knew anything about alfalfa in the old country. He said they did not. I asked them if they did not know about Lucerne? "Sure," we know about Lucerne." I asked them if they ever grew it in the old country and some of the old men said they had grown plenty of it. I asked them why they didn't grow it here, and they said it wouldn't do here. And they simply expected it wouldn't and did not try it. Now, in Wisconsin to-day there are 800 young men belonging to the short course as-

sociation, 800 men in Wisconsin scattered all over the state engaged in the special study of alfalfa. Think what that means to the 800 communities of Wisconsin. More than that, in Jefferson county at the present time there are something in the neighborhood of 2,500 acres. This spring the dealers tell me there are orders for seed already booked indicating a sowing of between three and four thousand acres, and that in this depressing season. A gentleman sowed 50 acres, a neighbor of mine. It was very thin, poor soil. He had a poor crop last year, about two and a half tons to the acre. He sold the crop for a thousand dollars, \$12 a ton. It cost him \$1.20 to bale it, and he sold it to the alfalfa mill grinding company at Elgin, and he sold two carloads to the gentleman who owns the famous Guernsey cow that made 1013 pounds of butter last year. He sold another car to a gentleman at Duluth. I could have sold 500 carloads of alfalfa this year if I had it, at \$12 a ton on board cars. But I did not want to spare it, with the stock I have, about 80 Guernseys. I am a good deal like the old Pennsylvania Dutchman, "I don't know God Almighty, how He feels towards me another year."

A Member: Do you grow the seed?

GOV. HOARD: I have been trying to grow the seed, but have been unable to do so yet. We have had wet seasons. They tell me you cannot grow it in a wet season.

A Member: How do you plant it?

GOV. HOARD: I sow it with a drill. You have these drills in this state where the grass seed box is in front?

A Member: Yes.

GOV. HOARD: Yes, that is the same as I have. I sow about 25 pounds to the acre on very heavy strong soil. Mr. Wing recommends 15 pounds. I prefer 10 pounds more for the sake of making it grow finer. I broke up a year ago 28 acres of alfalfa sod and planted it to corn. The neighbors say they never saw such a crop on the place before. The mechanical effect of alfalfa roots upon the land is wonderful. It required three horses weighing about 1,500 pounds apiece with a jointer to break it, and you could hear it, it sounded like they were tearing the strongest piece of canvas you ever saw. It was like plowing through a hazel bush.

The roots were in the soil so deep and so strong that it has a mechanical effect upon the land like this. A year ago last spring when I was breaking up and plowing my land—my land is heavy clay, it keeps me a little late sometimes, I got very anxious. I went at my plowing, and feeling I was plowing when it was wrong, and all my land plowed shiny, you know how that is, all except the alfalfa field, and that plowed like an ash heap. I began to study. That field was like a paper box bored full of holes ten to fifteen feet deep. I tell you we have dug alfalfa roots from these old fields twelve to fifteen feet down, went down to find out. You can see what a tremendous mechanical effect such a plant has upon the land. One old German says, "Mein Gott in Himmel. I grow not that stuff on that land, everything run all the way down through."

I thought it would, that it might injure it, but it serves to oxygenate the soil, and grinds and breaks it up and has a mechanical effect like a sub-soiling plow on the land.

A Member: Do the roots go down through hard pan?

GOV. HOARD: If you have hard pan very near the surface—the larger part of your land is not hard pan that will interfere with it.

A Member: Hard yellow clay?

GOV. HOARD: It grows right straight through it. Goes right down through a yellow clay. I have that on portions of my farm. You dig down five and six feet and you will strike this hard and yellow clay, sticky yellow. It was a white oak soil.

Now, I have given some ideas of its feeding value, some ideas about its growing. Let me say this: Prepare your soil, make as good a seed bed as possible. I threw away \$60 worth of seed of a rye field, harrowed the rye field three times, loaded the harrow, tore it all to pieces, and sowed the alfalfa on, thinking it would grow as well as clover. I never got a thousand spears of alfalfa, but got the biggest crop of rye I ever did get. But sow it with about a bushel of barley. Last year I sowed a bushel but being a wet season part of it lodged, but I sow every three weeks a bushel of barley, and I could get a fair crop of barley. I got 40 bushels seed off the barley, 40 bushels for one. But it was an unusual season.

A Member: How about 60 day oats?

GOV. HOARD: I do not know.

A Member: How will it do on sandy soil?

GOV. HOARD: If you can get it started all right—if you will give a coat of manure, a heavy coat of manure. Suppose you give it a good heavy coat of manure in the fall, and then in the spring, and the next spring you go on with a disc and give it a good heavy discing, harrowing, until you fine it down, then if you could give it about 30 bushels wood ashes, it is very greedy for that, if you can't get wood ashes you might get muriate or sulphate of potash, and disc your land that way and start it. If you can't get it going through the first summer it will be all right from that time on.

A Member: What about growing on limestone land?

GOV. HOARD: It prefers limestone land.

A Member: Clover burns out; it would not stay in. Does alfalfa do the same thing?

GOV. HOARD: Clover wants limestone land.

A Member: Can't get it to stay more than three years.

GOV. HOARD: The reason is that clover is a biennial and when once it forms its seed it dies of its own volition.

I do not believe there is any particular difficulty in growing alfalfa in Pennsylvania. Does the sweet clover grow here by the side of the road?

A Member: Yes.

GOV. HOARD: You need give yourself no uneasiness. Wherever sweet clover grows alfalfa grows almost indigenously if a man knows how to handle it.

A Member: Where do you buy your seed?

GOV. HOARD: I buy my seed usually of seedmen, but I am pretty particular about it.

A Member: Which ones?

GOV. HOARD: Well, that is hardly fair to say, but I usually have sent into Montana and bought my seed.

With alfalfa as with all kinds of hay, drying hay is not curing it. I want to repeat it, drying hay is not curing it. There is a wonderful difference in the feed value of clover and alfalfa, whether you cure in the dock or cure in the winrow and the sun. If you put it into the cock just as soon as the rake will gather it, just as soon as it will work on the rake, rake it up into the winrows, and from that up into the covered cocks, well capped. I use the hay cap. You do not know what is going to happen. The first crop is in the first of June, and I put on the hay cap. I have 1,500 of those little caps, they cost \$120 a thousand, 12 cents apiece. (Explaining the use of the cap by illustration.)

A Member: Did you spread this hay after you put the caps on?

GOV. HOARD: About an hour or two. My men came along and lift it open for an hour or two, just throw it open so the air can get to it, and oxygenate it, you know, and that will just finish the job. I want to haul it to the barn when it is just so the leaves won't fall.

A Member: How much do you spread each shock?

GOV. HOARD: Just a little, throw it out so as to give it a little air.

A Member: Do you like to haul in the heat of the day?

GOV. HOARD: I do not pay any attention to it. I haul it just as fast as I can. I am anxious to haul it before the leaves will drop.

A Member: What is your idea about inoculating the soil with other soil?

GOV. HOARD: I have tried it. I have drawn soil from the side of the road where sweet clover was growing, and drawn soil from one old field I had, on to a new field.

A Member: Do you think it helped it?

GOV. HOARD: Helped it. A year ago last fall I inoculated 22 acres with culture from the Department at Washington.

A Member: How much to the acre of the old soil?

GOV. HOARD: About a thousand pounds.

PAPERS READ AT THE ANNUAL MEETING OF
THE PENNSYLVANIA STOCK BREEDERS' AS-
SOCIATION, HELD AT THE MONONGAHELA
HOUSE, PITTSBURG, PA., JANUARY 18, 1906.

OFFICERS FOR 1906.

PRESIDENT.

W. C. NORTON, Aldenville.

1ST. V. PRESIDENT.

DR. LEONARD PEARSON, Philadelphia.

2D. V. PRESIDENT.

M. P. SHOEMAKER, Greensburg.

SECRETARY.

E. S. BAYARD, East End, Pittsburg.

TREASURER.

J. F. LANTZ, Glenmoore.

REPORT OF THE COMMITTEE ON STATE FAIR.

By HON. W. C. NORTON, *Chairman.*

I would say, last winter, in which I spent nearly the greater portion of my time in Harrisburg, it seemed to be a new matter to the representatives. They did not seem to understand. They had got the thing mixed with the old State Agricultural Society, and it was hard work to get it through their heads that we are not looking to the interests of the old State Agricultural Society, that we had no use for it, and that we wanted a new organization, and one that would be a success, which we could not secure by taking up the old organization. The old organization has got too much of a stench connected with it. Now, in going through the House and Senate we found, Mr. Bayard and myself, that the representatives as soon as they understood the matter were willing to vote for a State Fair. We had the bill prepared, as you all know, and while there was a very small amendment and some suggestions made to amend it in the House and

Senate, there would not have been ten dissenting votes against the bill. But when we came to see the Governor (we went to see him two or three times) we could not get any satisfaction from him. Finally, when he gave his decision, we found that he would veto the bill on account of the financial standing of the State. While I was in Harrisburg the other day the thought occurred to me that there wouldn't be quite as much fuss over the State deposits if we had a little of the money. We have a surplus of \$12,000,000, and it was a flimsy excuse that there was no money. There was no changing the Governor. Even Senator Penrose himself tried to argue with him, but could not do it. He had set his mind he wouldn't sign the bill, and that was the only reason he gave. He said it was a meritorious measure, and the people demanded it, but he couldn't see his way clear on account of the demand for the money for the hospitals and the insane asylums. Those were the two institutions that he seemed to base his argument on for not signing the bill. He could not get it through his head that they could support us with money from the State appropriation. A great many of the representatives said "We will put it through any way." When we came to study the matter over and look at it, we decided that it would be a hardship for the incoming Governor to sign a vetoed bill: and we decided to drop the bill where it was. I have no idea but a bill will go through in the next session. The trouble will be with the Governor. There is no use getting a State Fair Commission appointed unless we can have a reasonable appropriation to start that fair with.

There were some things occurred last winter I did not like. The old State Agricultural Society officers came to me and wanted to make an appointment, and because we wouldn't accept one of their number, making it binding on us to put one of that number on the Commission, they then said they would defeat the bill. We told them to go ahead and do their worst if that was the spirit they were working for—their \$2,000 a year. I do not think they can do us any hurt, but I do say I want nothing to do with the state fair that is going to take up with the old Agricultural Society. We want a live State Fair Association. We are going to have it or we don't want any. If the breeders here say there should be a State Fair committee appointed to go on and look after this legislation in the next session, we will do so, but there can be nothing done in the special session. But a year from now if this thing is managed rightly I don't see why we cannot get the law passed to go through the House and Senate and the only question will lie with the Governor. I think the postal card system would not be a bad idea. It seems that that scandal connected with the old State Agricultural Society we have to overcome. We have made up our minds not to have anything to do with it, and we don't want to be connected with it at all as an Association. If we do we have got that to fight, and fight from the start. We intend to start clean. We want the united effort, we want the help of every one, not only the breeders, but the dairy people and any one interested in agriculture that is not a dairyman or breeder, and we want the manufacturers. If the manufacturers are with us and the railroads are with us, why the Governor could not set himself up against the whole state I could not see myself when these men in Harrisburg were in favor of the bill. I have always felt we needed an appropriation so we could

start out, or else there was no use in trying to organize a fair. You cannot organize a fair on hot air. It has got to have something behind it. We want your help, and we must have it. There is no strength in one man. It is the united effort of us all that will do the work.

THE FEEDING OF ANIMALS.

By PROF. J. L. HILLS, of *Vermont*.

Yesterday afternoon I held in my hand a sort of blunderbuss with which I tried to sweep the whole horizon; to-day I have a rifle in my hand, and will address my talk at a single specific proposition—the feeding of animals.

That is an old story to the farmer. Animals have been fed from the time of the flood. For several generations this matter has been discussed before farmer audiences. Why should it need rediscussion? For two or three reasons: In the first place, there are many who fail to comprehend the fundamental principles; and in the second place, because this, as every other thing has vexed human endeavor in this year of our Lord.

I shall divide my talk into two parts. In fact, it will resemble somewhat a custard pie. There will be a sub-stratum, more or less undigestible; then it will have the superstructure of the custard which is much more digestible, and more palatable. So if those of you who do not care for the straight practicalities will go to sleep I will try to wake you up for the custard part of it.

Up to a comparatively few years ago the science of chemistry has been appealed to more particularly in this matter of stock feeding. We thought of protein and carbo-hydrates, we thought in terms of matter. Of late years another science, that of physics, has been brought into view, and we are discussing this matter to-day quite as much from the standpoint of energy, or force, as from the standpoint of matter. Now, to many people this second line of reasoning is not as clear as the first, and there are those who say: "We have learned what protein is, we have some conception of what carbo-hydrates are, why upset that? Why not lay your stress on those things, and why talk about energy. Why go into this matter from another standpoint? Let us lay emphasis on this thing we do know." There is some justice about that. On the other hand I believe it is well worth while to view these things from different standpoints. Take for instance, the cow. A man who is going to judge that animal does not look at her from the front only and observe her head, whether she has crumpled horns or not; doesn't observe her shape from there. He goes all around, front and rear, and views from every standpoint. In my judgment there is much to be gained by viewing this stock proposition from the dual standpoint of matter and of energy. Our animals, be they of the human or brute creation, are the most wonderful chemical engines devised. There is not one of these magnificent inventors of Pittsburg or Philadelphia that will ever match the Creator in the matter of the making of an engine.

The best of our steam and gasoline engines make use of a very small proportion of the total energy in the coal. You or I or our cows or our horses use a far larger proportion of the energy which we or they get in the form of food. Consider what a marvelous engine this is. It is self-feeding, self-stoking, and self-oiling, self-insulating and self-reproducing. It is a very different engine from any that has thus far been devised by man.

Now, look at this matter from the standpoint of energy and the standpoint of physics, in the long run, in my judgment, is to simplify these problems. It is not at present. Although it is my duty and pleasure both at the University to state these things and teach these things, I haven't begun to accomplish the things and get a clear conception viewed from the energy standpoint as I have from the chemical standpoint, but I believe that as the work goes on we shall see it in a clear light, and it will work out a simpler problem than has been worked out from the chemical standpoint.

Last May there came to my desk Bulletin 71 of the Pennsylvania Station. I read it over with a great deal of interest and threw my hands up and said, "Dr. Armsby comes nearer being an iconoclast in this matter of stock feeding than any man I have yet run across." He simply tipped over, to a large extent, a great many of the notions that we have hitherto been setting up. What was the general contention that he laid down there? I want to read it directly: "That the value of certain feed stuffs was decidedly lower than had been computed according to the current methods of establishing the amounts of digestible nutrients present." And I said, "Woe is me." Here I and my associates have spent thousands of dollars in calculating these 1292 several experiments based on digestible nutrients.

He said further: "Coarse fodder in particular we found to have much lower values than the concentrated feeds, the relative values of the former as compared with the latter being greatly overestimated in the feed tables in common usage."

A few years ago the world was startled by what Madam Curie and her husband discovered with regard to radium and the radio-active bodies. But what has come from her work and that in many laboratories of the world is rapidly revolutionizing our ideas as to matter. This class of work, the radio-active class of bodies, is changing our views. We don't know, to use the slang phrase, "Where we are at." We are ultimately to come at a more sane and accurate measure of things. That is just being done, in my judgment, when we look at this matter from the standpoint of energy. To-day much is in a "hallabaloo," not clear and not distinct, but we must unlearn apparently very many things, and learn other things that are more nearly correct. The man who never changes his mind (of course women do often) as new light comes to him is one of the most unsafe men to be the guide of other men. So I trust every man whose function it is upon the institute platform, or any platform, to teach this matter, or talk about this matter of stock feeding, will have an open mind and a receptive attitude as to these newer things, though they be at first uncertain.

However, this does not mean that we are to throw carbo-hydrates and protein into the Monongahela river. We are to still think of them in this transition stage, and I think for myself I shall use pro-

tein and carbo-hydrates. I am simply bringing this first substratum with a view to get into these minds this new light.

Now, in this matter of protein and carbo-hydrates we still must use them, we must still in this transition stage, I think, consider the chemical side of this proposition. We can't make milk without protein. Every thirty pounds of milk of average quality will carry about one pound of a modified protein in the casein and albuminous and kindred bodies. We must still look at that. And so for the remainder of my talk, which will deal with the more immediate practicalities, the custard, I want to direct your attention to these new materials as we find them in the roughages, the concentrates that are offered us for sale, or which are grown upon the farms. Protein, the flesh former—several other subsidiary functions, but primarily the flesh former. Casein, or curd maker; carbo-hydrates, with several subsidiary functions, but specifically the fat maker and the heat maker. Get those two close conceptions from the chemical standpoint—the flesh former ingredient, heat and fat producing ingredient. Now, in Northern New England with our long, cold winters and our short summers, it is difficult for us on the farm to grow a sufficiency of protein flesh-forming, milk-making, milk-stimulating ingredients to make a sufficiency for our cows, and we needs must go into the market for purchase. For these people who can grow alfalfa, which was discussed so ably from this platform last evening, the proposition is a less serious one, but even though you do have alfalfa you must at times go into the market for the purchase of materials to supplement a food, and so it seems to me it is worth our while for the next fifteen minutes to consider advisably the economical purchases. Now the roughages for the dairy animal, it seems to me, are confined to three or four: Hay, early cut, the more clover the better, or if you can grow alfalfa, better yet. A friend of mine in our state had been accustomed to say corn was king and clover was queen. And there was an irreverent cuss in his audience, who said, "What is jack and a ten spot." He could not answer. But alfalfa is the ace every trip, and I earnestly advise every one of you who have got lands that are at all adapted to that crop to try it at least in a small way next year. One way that was advocated here last night seems to me to be nearer the keynote in that line than any other. In all New England, in the last two years, we do not find a single permanent success with alfalfa, save in one limited locality, which is underlaid with limestone. Early cut hay, clover hay, those will give, however, more carbo-hydrates, more of the heat makers, relatively speaking, than it will of the milk makers, and flesh makers. Corn I hold first of our feeding crops, corn in the silo—and I do say emphatically that in this year of our Lord no dairyman can afford to keep house or keep a farm without a silo on it. Lots of them say, "Why, with silage we hurt the milk." I have heard when the silage milk was eaten by the babes it was injurious to them. In Illinois they tried this matter and gave to over a hundred families a quart of milk, and asked those families to critically use that milk, and there were more who said the silage milk was better than gave the non-silage milk the preference. In fact I do not believe the modern silage hurts the milk.

Some years ago Dr. Armsby's station put out a bulletin on the making of cider. I want to know how many of you can see, however,

so far as your cows are concerned, the residuum of that cider manufactured apple pomace. I am here reminded of a story of a judge in one of the New York courts who was trying a negro woman for mistreating her son. He had her on the stand, and was going over the harrowing details, how she lambasted the youngster, and the judge said, "Stop, madam, why did you treat this boy in such outrageous fashion; I am shocked." She looked at him with fine scorn, and said, "Look here, judge, were you ever the father of a worthless mulatto boy." The judge naturally pretty nearly fell off the bench, but he collected himself and said that whatever his sins might have been that hadn't been one. "Well, then," she said, "if you wasn't, you don't know nothing about the case." Now, there is many a man when I first talked bout this matter of using the apple pomace, who wouldn't take it. If you haven't tried it you don't know anything about the case. Apple pomace silage is good and does not hurt the milk or butter.

Passing to the other side of this matter, in the matter of the concentrates, the Secretary of Agriculture last night told you something of what the State was endeavoring to do in the line of protecting the dairyman in the purchase of concentrated feeds for their cattle. He stated they have started some prosecutions along these lines. There is to be a conference next spring in New York City, I presume among the stations of the northeastern part of this country, as to what may be done in this matter of the feed shortage in the protein contents of certain of the concentrates that are commonly sold through here. Our state laws in many of our states are nothing in this matter. But now while legislation may be and is of decided advantage ways in connection with this matter of stock feeding, it will not and cannot take the place of intelligent judgment of the individual. Legislation will throw about certain barriers, but it won't do your thinking for you. The station work and station publications are not to lessen but to increase your labors. As I frequently have said, investigation in agriculture is not a staff for farmers to lean upon, but a rod to stir them with. It seems to me it is worth while for ten minutes to discuss this matter of the relationship of these concentrates to specific uses or that their part in stock feeding. On every bag of concentrate sold in the State of Pennsylvania, barring a few specific brands, there must be printed a statement as to its composition in terms of protein and in terms of fat. Now, to the man who buys that bag in this fashion, the printing thereon will not amount to a row of beans. The man who buys with his eyes open, and looks at it, and cogitates about it, and fixes in his mind the man of greatest observation, who studies the relationship between that statement and the price and the cow, will make far more and better purchases than he who simply buys upon the statement of the agent. I read two or three years ago in the "Rural New Yorker" a most enlightening article, written by my friend Masters of Connecticut. It was entitled, "The Confessions of a Feed Dealer." He told me nothing new, but I imagine it was new to a good many people. He said when he went into this feed business it was a side issue to another line of work he was in. He was actuated largely by altruistic motives. He thought he could do good to his fellow-man and associates and friends by suggesting that this or that feed was the better. He thought he could help his people along that way.

He told them cotton seed and linseed, although higher priced, were better values. He had great difficulty in selling them. They misconstrued his motives. To-day he has given it all up and sells what they demand, and sells them as well as the goods very often. Now, while the protein is not, in a slang phrase, the whole thing, still in the present inchoate state of our knowledge it is wise advice in my judgment to suggest that the dairymen fix his eye upon that guarantee, and when he has to buy for dairy stock to make that the main proposition. One cannot in fifteen minutes tell the whole story of this matter. It takes me a good many days in my class-room. But that is the main proposition. That does not mean because cotton seed meal carries 48 per cent. protein, the highest of any, that doesn't mean that is the sole and only thing to buy. It is too concentrated, too heavy. Second, the economical character of the seed ought to be considered. Distillers grain and things of that kind, which are flaky and light to open up the ration, are better adapted to the feed than the bulky concentrate for the cow than are these heavy firm materials, like cotton seed and linseed. When I am talking about this matter I usually go out of my way to throw a bouquet, as it were, to linseed meal, because though not so rich in protein as one or two other materials, it is a great feed. It seems to me that the American public needs to be warned of one thing above everything else, and that is as to the true character of these proprietary mixtures known as the oats feed. A little Jew boy was standing in front of his father's store one day, and he came in and he said, "Father, there is a lot of little birds out in front there saying cheep, cheep, cheep." He says, "Iky, go and get those birds and put them in the window so they may say cheep, cheep, cheep to people." That cheap, cheap, proposition to many of our ill informed dairymen is the main proposition. Our state pays three and one-half million dollars a year for the purchase of foods from the West, and a million and a half of that sum is paid for corn meal. And yet the last census and the census of 1890 showed of the two states at the head of the states of the Union in the matter of the number of bushels of corn to the acre, to New Hampshire and Vermont. Yet Vermont farmers sent a million and a half dollars a year to Kansas to buy concentrated sunshine. Purchase of corn meal for the purchase of oats for the feeding of dairy cattle is an economical crime. The growing of corn and leaving it right up on the stalk, and the putting of the whole thing in the silo is a pre-eminently better way to treat that plant. They tell a little story of a man who went down to Boston one day and went into one of the cheap restaurants, and he called, among other things, for bread and cheese. The cheese was made from skim milk. He reached over to the butter, and he spread it on top of the cheese. And he said, "Come together here, you two, what poor fools have separated you." Now, man plucks off the ear from the stalk where God placed it and puts it in the crib, and takes that ear and those of his fellows ears to the miller, and pays him a tenth toll to grind, and then takes it back again and places that corn meal, that stover, before the cow. That does not, so far as the cow is concerned, add one jot or one tittle to the digestibility of the matter or to the energy, but the cow does; as many an experiment station and many a practical feeder has found, that the animal does poorer work on those two when they are divorced from each other

when they are put together. With all reverence let us repeat the marriage ceremony, "What God hath joined together, let no man put asunder." We fed two years with several of the different concentrates, and our cows told us the story. It is not what the chemist says. Hominy meal is rather better than corn meal for milk purposes, but at the prices at which it is ground in New England of late years it has not proved an economical concentrate to buy, as some of the richest materials as a milk maker.

A Member: What are wheat screenings?

MR. HILLS: That is simply a nice technical term for weed seed. It may be fed to sheep but their digestive powers may be destroyed, and destroyed to quite a large extent.

A Member: Are the screenings ground?

MR. HILLS: I am not certain. A weed seed where every one is smashed is not going to do any harm. The danger in this matter that we cannot be sure those seeds will not pass through the animal and sprout. If we can then there is no reason why digestible nutrients in every material should not be utilized.

Speaking about a balanced ration. It does not seem to have entered into the conception of man very much that the cow is under a rigorous law to make a balanced ration herself in her milk making and eating for the feeding of another animal. She has to balance that ration. She cannot help herself, and the question of why you should feed protein and why you should feed this other feed as long as you can balance them rightly is governed by the fact of the work the cow has got to do herself. The Governor is entirely right, that in 30 pounds of milk, the cow has got to put a pound of protein, and if you do not give her that protein to put in there, she will take it right out of herself or give you less milk. She is a fairly good cow of the pure bred type, she is very likely to pour herself into that milk pail. I have heard it said the cow is like the Arkansas jury, find for themselves first and for you second. That balanced ration is not man's conception, it is made by the very animal herself. Another point about that balanced ration among dairymen. In former years that balanced ration was governed on a rigid rule, but the true balanced ration is made out of rubber instead of iron. What is good for one is not good for the other. These standards are not rules, but guides, not cast iron, but India rubber, and to be interpreted with intelligence and with judgment.

GOV. HOARD: When you strike thirty cows you strike 30 rigid rules. Each cow stands rigidly to her own rule. There was an old German who said: "The state pays me \$4 a day for institute work. I don't know that I am making anything. The cows do better when I can breathe on those cows." I don't believe it was that man's breath, but it was his careful oversight of those animals. He knew every one of their animals, their needs and their desires and their ways as he knew his children. That is the successful man in dairying.

MR. REICHERT: Is it your idea the farmer should, in buying these concentrated feeds be governed entirely in the price of pro-

tein contained? For instance it is said there are 860 pounds of protein in a ton of cottonseed meal which would make the protein costs three and one-half cents a pound. Now, is that your idea? There might only be a dollar's worth of fat in the cotton seed. I might take another feed in which there would be \$22 worth of protein in a ton and \$4 worth of fat, and the total value of the feed would be more, counting the fat and protein, than the other that has only \$24 worth of protein? Is it your idea when you buy concentrated feeds that would be safer to take into consideration simply the pound value of the protein in the feed?

MR. HILLS: Twenty years ago I bought for a certain lady a ring which contained a ruby and a diamond, which I am glad to say she still wears. Two years later I bought for her another circuit which was of gold, and which she still wears. Now, in that second purchase I paid for just one thing, gold. For the first purchase I paid for three things: I paid for gold, for the ruby and for the diamond. Now, in that first (chronologically engagement ring), how much did I pay for the ruby, how much for the gold? I paid just one lump price. You can't separate. And so in the case of cottonseed meal. There is no such thing as buying protein *per se* on the market by itself, or fat by itself or carbohydrates by itself. We can't in my judgment apply any commercial price safely to a digestible protein.

A Member: Is it worth while to make molasses feed on the farm?

MR. HILLS: I think for certain stock feeding, particularly for working horses and things of that kind, the molasses has distinct merit. But whether it is worth while to make molasses on the farm I am not at all clear. We do not have it up our way. I should think for the horse it would be worth while; for the cows I am not clear.

THE MERINO, ITS UTILITY AND ITS DEVELOPMENT.

By MR. JOHN P. RAY, *Bloomfield, N. Y.*

The subject of my remarks—the Merino—does not refer to any mushroom breed clamoring for public favor—the offspring of a night or of a score of years. The stretch away of many centuries is all her own. The facts surrounding the origin of Merino sheep are locked in the chambers of antiquity, and no man holds the key to unlock the mystery. This opens a wide field for speculation and romance. When Adam was appointed a committee of the whole to pass upon and name the kinds of animated nature, the verdict was “very good.”

Merino sheep more than any other conserve the comfort and well-being of man. They know no North, no South, no East, no West. The world at large is their empire. Wherever vegetation grows and civilization obtains a lodgement, there they find a congenial home. They possess the inborn capability of being developed into any

type that a country may need or fashion or taste of man dictate, and this is a great quality to possess. Their fleeces enter into fabrics for which there is no known substitute among textile fibers. Their sociability or love for companionship induced them to flock together. In length of days and years of usefulness they are the antediluvians among sheep. Were Noah's two rams an Infantado and Paular respectively? Tradition has it that these sheep trace from Spain through Italy and Tarentine into Asia Minor. Were Job's 14,000 sheep Merinos? The record makes no mention of their lack of herding quality. Merinos are the only kind that herds well. What other breed after being led into green pastures and by the side of still waters would lie down in serene repose beneath the shade of a cedar of Lebanon and inspire a man to write that immortal twenty-third Psalm. "The Lord is my Shepherd, I shall not want?"

I have known a lot of Merino breeders who were good whole-souled men to be trusted with gold uncounted. The shepherds on Judea's plain were deemed the fittest among men to witness the rising of the day-star of hope and hear the heavenly benediction "Peace on earth, good will to men." But why speculate? We know that they are the oldest breed of domestic animals and this is glory enough for you and me, my brother.

The richest legacy that has come down to us from the ancient Roman Empire is Merino sheep. Well did the haughty and proud Spaniard know the value of these sheep and what it meant to a nation to monopolize the breed and the fabrics made from their fleeces. Then were they the sought after by kings, the envied by princes. To be clad in Merino fabrics was a prouder distinction than to wear purple and fine linen. The Spanish nation was not true to herself or loyal to her brother man. Over against her record as a nation were written the words "Mene, mene, tekel upharsin." Her rule and sway was broken and her greatest good divided with others.

If deeds are measured by results, and institutions by the amount of human good, comfort and material well-being which they promote, then the bringing of the Spanish Merino to our shores by Humphreys, Jarvis, Crowninshield and others should place their names high on the scroll of fame as public benefactors. And scarcely less should we esteem the men like Jarvis, Atwood, Blakeslee, the Nettletons, Rich, Beedle, the Quakers of Lebanon, N. H., and Bailey and Potter of Rhode Island, who preserved the Spanish blood pure from imputation all through the vicissitudes which intervened from the beginning of the last century down to the decade of 1840-50, when they engaged the attention of master breeders like Hammead, Sanford, Robinson, Stickney, Elitharp and a few others who began the improvement carried on by their successors which has given to the world the marvelous American Merino, the greatest wool-producing animal the world has ever seen or will see, and established a blood line that can improve all other breeds in quality and amount in the land of Merino extraction whose blood of fleece. Possibly there may be a few flocks has not been mingled with this strain, but they are unknown to the speaker. The successful breeder employs methods and applies principles that may well be imitated by

all sheepmen, both as to care and keep and judicious matings for result.

This brings us down to the three heads under which we propose to discuss the subject in hand: The breeder, his material, and the principles governing his operations.

THE BREEDER.

Breeders may be classified as good, bad and indifferent. The good breeder has his ideal and no influence swerves him from his purpose. He shapes and moulds his animals as the potter does the clay and establishes a breed line that can improve the breed or kind. The bad breeder is one that has no ideal, no fixed type in mind. He goes hither and yon and is swayed by every influence that crosses his pathway. He has everything in moderate type and nothing that stands for quality. The indifferent breeder is one who buys a strain of blood or distinction that he fancies will be popular. He has no knowledge of quality or blood line. With him a sheep is a sheep. He mates with no other purpose than to preserve the blood and breeds scalawags that are a stricture on their kind.

Now who is qualified to be a good breeder? Not everybody. Great breeders, like great artists and musicians, are to the calling born. By this we mean that they must possess natural traits and gifts that fit them for their mission. He must have an admiration for animals that nothing can abate, love their companionship, and be happy and patient while ministering to their wants and comfort. He must readily individualize and discern that every animal has a form and feature peculiarly its own, and grasp as by intuition that indefinable something known as quality. He must be an idealist and fix in his minds' eye the typical specimen, and have the creative genius to group his material and produce the specimen. Education and experience will give him ripeness for his calling and give expectations of better things farther on.

THE MATERIAL.

Having a call to the work, the first move is to select the breed—not breeds; one is enough. In this he should be guided by individual taste, environment and prospective demand. Having settled this point, get acquainted with the breed or kind. Study their history. Go up one side of the animal and down the other. Lay hold with a tight grip of the great essentials of constitutional vigor, size, form and fleece qualities and of what is of scarcely less importance—fancy points that give finish and attractiveness to the animal. Visit flocks of note and character. Ask a lot of questions, express very few opinions, and “saw a lot of wood” as the saying goes. Visit the fairs and watch the show ring and find out if possible the whys and wherefores of the judge's action, more especially if he is a noted and successful breeder of the kind. Such men are judges and their work educational. Do not buy until you have confidence in your own judgment to select, and begin to paddle your own canoe right from the start. Pin in your hat the motto that the best are none too good and the best are the cheapest. Better start with a few specimens and start right than to start with more that you have to hoist into rank by years of breeding.

Strive to get the other fellow's great-producing ewe or ewes. Every flock has its mother queen. Several times we have purchased lots of ewes ranging from six to ten, and found that some one ewe in each lot was worth all the others as a blood line to improve or add to the standing of the flock in general. Seize and hold fast the old maxim that "like begets like" or the likeness of some ancestor as the law of transmission and inheritance, begetting like when the potency of like types in sire and dam overcomes the law of atavism, or striking back, and gives mould to offspring like some ancestor when this is reversed. Inscribe on your banner "The stock ram is my lever and he counts 60 per cent. of my plant."

It may show a lack of delicacy and do violence to the law of propriety to tear some leaves from a chapter of personal experience, but we are going to do it just the same. In 1881, we had two sons of Bismarck at the head of our flocks, one of our own breeding, the other purchased of Mr. Burwell. These were quite liberally patronized by outside breeders. Among them was Mr. Jas. R. Worthington, who bred five ewes to each ram. The conditions were that we were to choose a lamb from one ram's get and decide in advance which ram's get we would draw from. Prince Bismarck was our favorite and of our own breeding, and we named him. In each bunch was a very choice ewe lamb. We liked the lamb got by Towando, the other ram, best and Mr. W. preferred the one we were entitled to take and an exchange was made. For two succeeding years he bred ten ewes to Prince Bismarck, we to have our choice of each crop of lambs. From the first crop we selected a ram lamb which we named Dudley, and that later proved a first prize winner at our State Fair. Our next selection proved to be a sister to Dudley, that won first and champion at our State Fair when six years of age. When preparing the pedigrees of these sheep for registration we found that the Towando ewe was out of his ewe Madam Dudley No. 21 and that the other two were out of No. 60 and she out of Madam Dudley, and that we had dipped deeply into his great-producing ewe family. Towando ewe 159, bred to Martin's Block, produced Don Dudley. Dudley is a connecting link in the chain of sires between Mr. Peck's young Bismarck ram, the only promising one known to the speaker, back to the great Bismarck. The Prince Bismarck ewe No. 195, bred to Prince Dudley, a grandson of Dudley and out of Don Dudley's dam, produced Rex Dudley, which proved a greater ewe sire than Don.

In 1899, on account of a severe illness, we were obliged to sell our flock of sheep, that represented the work of nearly forty years, steady pull. When health came back to me again the love for the Merino came back also, and red-hot too, and when laying the foundation for flock No. 2 we were in possession of some facts that were valuable aids to us. We knew that all our improved American Merinos, were descended in the male line from Sweepstakes, Comet and Eureka and that our most remote blood lines were more or less of kindred strains. So we sought divergent lines of a common type and type bred. We made our selections from Vermont, New York and Michigan flocks. From Mr. A. A. Wood we secured a ewe we sold him with our flock in '99. She was bred by Geo. N. Payne, Bridgeport, Vt., and got by Don Dudley. This ewe we considered the best ewe lamb we saw in Vermont that trip. My in-

timate friend of many years, Mr. T. J. Wynn, Lakeville, N. Y., had clipped 25½ pounds and would weigh 152 pounds in full fleece. She was by Rex Dudley dam by Kaiser, bred by us, and a son of Prince Bismarck, dam by Custer, a son of Bismarck. Kaiser was one of the best show rams bred at Pine Ridge. He beat the famous ram Jay Eye See at our State Fair. His full sister was the second dam of ram No. 179, J. P. Ray, known as Gold Bug, Jr., which has been held in such high esteem in Illinois and Ohio. This ewe we considered indispensable to our success, but to buy her or trade her we could not. We could only get her as a partnership ewe to breed on shares, each to own a half-interest in her progeny. We did not know of a single ram that met our ideal as a sire and show ram. Mr. Worthington, previously referred to, had a yearling ram of his own breeding, now known as Don's Champion. He was by Champion, son of Block, dam granddaughter of Don Dudley, and was a member of the Madam Dudley tribe. This ram was the most phenomenal specimen we ever saw on the score—of massive folds and weight of fleece, clipping 43 pounds 3 ounces in his three-year-old form, an even years' growth. He lacked somewhat in head, leg and style of fleece.

We recalled the facts that two removes from Bonaparte, another ram of this ilk. Mr. Burwell bred Bismarck and Stub, and Mr. Crane, Eureka 3d, and that from Fremont, Jr. Mr. J. T. Stickney bred Centennial and Stickney's 146, and that Kilpatrick, a large, coarse, heavy-boned masculine ram, was the corner-stone upon which L. P. Clark builded. This knowledge led us to desire an interest in Don's Champion, which we could secure only as a most generous gift from Mr. W. From this ram and the Wynn ewe was bred Bonanzo, which Wynn & Bell won first and champion on at St. Louis in aged division, class A; and from the same ram and the Payne ewe was bred ewe No. 2, and from Bonanza and this same Payne ewe was bred Don's Rival, which won first and champion in yearling division and Grand Champion of all ages in class A, ewe No. 2 and Don's Rival winning ewe's progeny prize also.

Our apology for indulging at such length in recounting personal experience is the wide dispersal of the blood of Don Dudley and its world-wide popularity, and the great quality and show-ring form of others, and to emphasize the fact that the best breed the best, and the importance of the blood of great sires and producing dams in improving a race or breed.

PRINCIPLES GOVERNING THE BREEDER'S OPERATIONS.

While we place so high an estimate upon the blood of the producing dam we know of no feature of the breeding problem that demands closer scrutiny or wiser discrimination. Every observing breeder knows that among matrons that throw individuality in their produce there are two distinct classes, the positive and the passive; the positive possessing individuality by right of inheritance and capable of enriching a blood line in volume and momentum; the passive perhaps lacking in both quality and breeding, serving simply as a channel through which the sire throws his type, yet unreliable as a breeding-on force. I cannot illustrate this point more forcibly than by taking two entire sons of the mighty Electioneer, which made the name of Leland Stanford famous the world over as a trot-

ting horse breeder: Palo Alto and Chimes, the first-named with a trotting record of 2.12 $\frac{1}{4}$, and Chimes, that never could take a record of 2.30, unless he was capable of it in his two-year-old form. Palo Alto was a failure as a sire of speed. Chimes ranks great among great sires and is the greatest of his sire's get. Palo Alto's dam, Dame Winnie, was by Planet, a Thoroughbred. She could not trot, had no trotting inheritance and could not impart the trotting gait or trotting instinct. This she left to Electioneer. She may have given Palo Alto lung capacity, texture of bone, courage to speed fast. Chimes' dam, Beautiful Bells, was by The Moor, a Clay, second dam by Bald Chief, a Mambrino 3d, dam by Strader's Cassius M. Clay, Jr. 4th, dam by Abdallah, sire of Hambletonian, trotting-bred for generations.

In a prospective sire we want individuality and breeding in the two currents that compose his blood line—great sire and great dam. Don Dudley transmitted his own type to both rams and ewes; Rex and Kaiser that of their dams. Hubbards' Leader had objectionable characteristics that were not found in his sire, Jason—his dam had them. This ram got more spotted noses and black feet than any other ram I ever saw. The dam of Burwell's Hercules, son of Bismarck, had a straight, wiry fibre. This ram did much to destroy the beautiful highly-crimped and lustrous fleece imparted by Bismarck. I would not buy a ram without personal inspection and a thorough knowledge of sire and first and second dams, and as many more as could be reached.

Is in-and-in breeding a correct practice to follow? We answer yes and no. Safe with wise selection and a mighty lever for improvement carried down to the danger line, and a powerful engine for destruction carried beyond that point. Many are the one-time noted breeders who have plunged headlong into that pitfall. They became giddy over success and were too proud and narrow to recognize merit in other strains. They harped upon concentrated blood for potency, forgetting that type was the measure of individuality and that type depended upon type breeding. With how close relationship is matting admissible? Never with sire and daughter, mother and son, or full brother and sister. If conditions seemed to demand it I would mate half brother and sister where the dams of each were of remote blood, and the progeny of half brother by the same sire whose dams were remote from each other. This is conspicuous in this respect. To my mind the greatest danger that lies before American Merino breeders is the kindred blood of all our flocks.

Are so-called violent crosses dangerous and unscientific? No. What are violent crosses? The matting of a fine-fleeced ewe with a strong-stapled ram, a small ewe with a large ram, a plain light-fleeced ewe with a wrinkly, dense, heavy-fleeced ram. Go beyond your ideal in a ram in the object sought for the first cross and to your ideal for subsequent crosses, and stay there. This is the cross-lot route to the goal.

Is uniformity in a flock the test of a breeder's skill and a measure of the value of his blood line? No, uniformity is but another name for mediocrity. The blood that improves a breed comes from the flock of the breeder whose motto is good, better, best. Never use a ram more than two seasons on the same ewes if it can be avoided.

Who ever saw the third crop of lambs from same sire and dams that were equal to the first and second crops? If the nick is great use a good son and then go back to the old ram. Who ever saw a really great ram that had a full brother a year younger that was his equal? I never did. I killed a brother to Don Dudley for mutton (and it was as good a fate as he deserved), and sold a full brother to Kaiser for \$2.50 to be slaughtered. Great are the mysteries of the breeding problem!

We have taken the American Merino as a special subject for discussion because he represents one of the highest achievements of the breeder's art, and because the family should be preserved as the fountain-head to be drawn from for fleece improvement, and because the principles involved in his successful breeding apply to all breeds and kinds of domestic animals. Many long centuries have intervened since the Good Shepherd said, "How much better is a man than a sheep?" Then put the man behind the sheep and be true to your own manhood and to your brother man. Let your name stand for all that is moral, honest and upright, and let your methods and practices be an open book, read and know of all men. If he who makes two blades of grass to grow where one grew before is a public benefactor, how much more is he a benefactor who enhances the meat or wool-producing capacity of a breed. Verily he should rank among princes and not among mean men. "But," says one "are all these rules to be observed in successful sheep breeding, and are the principles laid down inviolable?" We answer yes, and more too. In these strenuous days of heroic endeavor, when success is measured by marvelous achievement, every detail that contributes to the end becomes an essential. I pity the man who has no ambition to stamp his name and impress upon something that will benefit his fellows. Such a one is a weakling and unworthy of true manhood and his generation.

One word more and I am done. I believe as surely as the sun rises and sets in his course that the Merino is to come back and claim his own. For more than three-fourths of a century he was our national sheep. The forces that drove him from his birthright, free trade and shoddy, were unnatural, abhorrent and forbidding. For fleece production he stands out separate and alone. In hardiness he has no rival. As economical mothers of mutton lambs when mated with that object in view they challenge any and all breeds. I believe that a careful survey of world-wide conditions warrants the belief that a long period of prosperity lies before the American sheep farmers. So care for the sheep and kill the dog.

GOV. HOARD: You are proceeding on the line that the type you are after is on the male side?

MR. RAY: Always, it cannot be otherwise.

GOV. HOARD: I wanted to know why you don't use the sire on the same female more than two seasons. That question of nicking is something clear back. I have got a Guernsey bull that nicks most splendidly with the majority of my herd, but I have six females that he don't nick with at all, and he didn't get me but one calf from those six cows, and that bull couldn't do his work with those cows right. I keep another bull, and I am trying to see whether they

will nick with him. I can't find out in my course of breeding that this law you speak of applies.

MR. RAY: I do not know that it does apply with cattle.

GOV. HOARD: I am interested to know if it applies anywhere.

A Member: Does a grade ewe ever follow a great ram, both by the same sire?

MR. RAY: In this case it seems to be an exceptional one.

MR. NORTON: Does the female throw herself through the sons and daughters or both?

MR. RAY: I don't know, but all great men have great mothers. Isn't that so, Governor?

GOV. HOARD: That is what ails you and me.

MR. NORTON: In the Jersey family you have a cow that never produced anything in the female line worth keeping, but her sons were good.

MR. RAY: That is often the case. We find it so with some sheep. They never produce a good ewe. There is a great difference in rams. There are mysteries in these breeding problems we have no information on.

DR. PEARSON: Kill the dog and save the sheep. I think that is one of the most important things we can consider with relation to the sheep interests.

SOME THINGS IN CROSS BREEDING.

By GOVERNOR HOARD, of Wisconsin.

Before starting in on my subject I have a number of sheets here which are the tables of the cow census taken in Ohio, which was published in Hoard's Dairyman last April, and I want to spend just a few minutes talking about this work. I have been taking these census and have spent now nearly three thousand dollars in taking them in different states in the Union, employing the most expert men that I can get. They have to be men of exceedingly good judgment in order to supplement the lack of knowledge and judgment which the farmer has. I take invariably the men who have furnished milk for one year at a creamery, in order that you can have the creamery back ground to fall back upon to determine the amount of cash and the amount of milk, and the census-taker investigates the farmer, the number of cows, the way the man handles the cows, how he stables, etc. He goes to the creamery and gets the return in cash, and he divides the one by the other, and the quotient is irrevocable. Then they kick and declare it is not right. But then they are answered by saying, "Well, you furnished the facts; if you lied then there is no recourse." Now, this was evident

to me, that there was a terrible waste going on because of a lack of knowledge all over the United States in dairy work. In 1886 I caused to be taken a cow census of the town of Ellisburg, New York, the second dairy town in the United States, containing 5,280 cows, 300 dairy farmers all at work in the cheese factories. Mr. Jenkins took the census at an expense of about \$500, having the entire summer in hunting out the work of every individual cow, taking the amount of food that she consumed, pasturage at \$9.00, and summing it up, and going to the cheese factory, and learning what she would earn, and then holding up the mirror to the patrons and the farmer to look at it, and brought the farmers of Ellisburg in debt \$25,000. It seems the feed the cows had consumed would have sold at the local market for \$25,000 more than the cheese factories returned. That created a great deal of consternation in the town of Ellisburg. In two years from that time he went and took another supplementary census and found there had been a remarkable revolution in the economic progress of those people. From that time to this that foolishness has died out in the town of Ellisburg. But it is all over the country. I have had about a hundred herds taken in Pennsylvania; fifty herds taken at Melrose; fifty herds taken out in another portion. This census was taken in Ohio, and here are various columns. The first in number of the patron. No man's name is given, but every patron can have his number if chooses. The number of cows, the estimated cost of the keeping, number of pounds of milk per cow, return from the creamery per cow, number of pounds of butter per cow, profit or loss per cow, received for \$1 worth of feed, average price of milk per hundred. Now, in the column that will interest you most is the profit and loss per cow. This reckons for every dollar's worth of feed. In that column of figures below \$1.00 represents the loss—that is the difference between the figure and \$1.00 is the loss. For instance No. 2 the return for \$1 was 95 cents, and the loss was five cents. Another one 66 cents, loss 34 cents on every dollar, and so on. Now, you would be perfectly amazed at the lower economical skill and judgment of the men who are keeping cows, the number of men. Now, before I start my talk this afternoon, which is based partly on a lesson in cross breeding—I want to give you some calculations worked out from the recent cow census taken in Minnesota. I want this thought to underlie all you hear from me afterwards, taking it as a two-foot rule in your pocket to measure things by. You know there is an old saying that every man gives of his own measure, that a man who carries a two-inch measure gives from that standard, another man a two-foot measure gives that much more. Every man comes to his task, every man comes to his cow, every man comes to his fellow-man, every man comes everywhere by that power of measurement that he has established in his own mind. At the close of the Minnesota cow census which has just been finished in Hoard's Dairyman, I divided the patrons into two classes: the readers and the non-readers. I became wonderfully impressed in my investigation and study with the fact that the power of every man over his own fortune in this business depends upon the attitude, the way he opens his mind, the manner with which he receives impressions.

The question of whether he reads or not. Out of the 100 patrons

63 are readers of agricultural papers and dairy papers or both, and 37 do not read. Now, let us see what that classification has to do with their fortune. The readers receive for each dollar's worth of food consumed by their cows \$1.38 and the non-readers receive only 87 cents. The former class receive a profit of \$10.00 per cow, and the latter a net loss of three dollars per cow. Think of a man struggling and struggling and working and working in that way. It is too bad, isn't it how the state suffers, how the community suffers, how the man suffers, and do you wonder that Christ said to Jerusalem, "How I would have gathered you as a hen gathereth her brood, under her wing, but ye would not."

I was interested to know what the total return from the 100 herds there by adding the amounts together. I found it to be \$30,280.00 and the cost of feeding \$25,066. This made a net profit of \$5,152. The question came to me: Supposing all the herds in the hundred were as good as the best, and there is no just reason why they should not be, what would the returns then be? In calculating upon this basis I found the return would have been \$57,244 instead of \$30,218. The cost of food would have been \$28,168 instead of \$25,066, over \$3,000 more, but a net profit would have resulted of \$31,076 instead of \$5,152. In like manner I took the poorest herd and here are the results. The total returns from the creamery would have been \$14,486 instead of \$30,218. The cost of feeding \$25,150, a little more than actual cost for the 100 herds reported. If all the herds had been like the poorest there would have been a net loss of \$10,664. On the other hand if there had been a community which had 100 herds equal to the best the patrons would have marketed their grain at a product of \$31,056. Now, it is very hard to get the average farmer to see the tremendous effect that this economical talk has to do with him and his fortune. I do not know the reason why except that it is his head is submerged. I heard an old story of an Irishman going through a piece of woods in Wisconsin, and a man sunk in the quicksand. He rushed over to a Yankee house nearby and he says, "Come over here for the love of God, here's a man sunk in the mire." And the Yankee says, "How far is he in." He says he is in up to his ankles. "Well, just let him get out. Wait until he gets up to his neck." "Yes," the Irishman says, "he is in the other end first." That is what is the matter—it makes a difference whether he is submerged head first or feet first in the morass. And if we could only get the average agricultural man to take time to think and read, to get time to stop, what would be the result? I don't suppose we will have time to ever do very much with the present generation of farmers. The only hope I have is the young men coming. If I can get the boys turned that way, get them to think, get them to take in these ideas in the common school, and get them to know what the terminology of agriculture means, so when they meet it in agricultural reading they will understand it, it will do more for the future of farming in the United States than all the colleges in the world. Now, you will say in the question of agricultural education I am reaching further. The boy that is to do the farming, that is to be. You say it is impracticable and a whole lot of theoretical schools. Let me give you one instance. I had a German farmer who has been working for me for ten years at my home place. He takes care of my property there, and my horse and stuff.

One day I was out on the farm and I had a piece of ground that was acting refractory and stubborn. I was puzzled with it. I says, "John, what is the matter with that land." I was surprised to hear coming out of that old German farmer's lips the words, "That land got no humus." He had learned the lesson when a child. And he went on to say that humus was decayed vegetable matter, that it was plant food, that it served to hold the moisture in the soil, and he says, "Without the moisture the plant cannot grow," or as he says, "The plant drinks, it don't eat." That German farmer peasant had been better equipped in his childhood with the science of agriculture than 99 out of a hundred of American farmers to-day, fifty years old. Now, who did that for that German farmer peasant boy? His government did it. His government had the practical understanding and ability to look away down to the roots of things, and see that at the kinder school, the child's school, shall acquaint the child with the meaning of the terms. When I started in the Hoard's Dairyman the feeding department questions and answers, I received thousands of letters from farmers all over the United States, What do you mean by the terms you use? What do you mean by protein, carbo-hydrates, nutritive rations? These men were not without brains, these men were earnest thinking men, but their government, their state, had not done its duty by them. It had never taught them the meaning of the terms they were obliged to meet in agricultural study and reading, and of a necessity it was to them like a foreign language. There were no equivalents in these words I could find. I had to use the words, and so I put a glossary up there at the head of the department, a little dictionary explaining the meanings of all these terms that I had to use in agricultural chemistry. I got hundreds of letters thanking me for the information, for these things were made plain to them. That is one reason to-day why farmers do not read more; it is because their common school has not equipped them with the information that they are justly entitled to. It is not because they have not good brains. It is because the system of education throughout the United States is a wrong system. It is reaching for a higher education, but God knows there is no such thing as higher education. All facts and all knowledge are correlative, co-related. The words higher education is a misnomer. It has no business in your vocabulary or mine. The word to use would be a wider education, not higher. There is no altitude in education, it is width. So you see if a man occupied a foot of knowledge, the thing for him to do is then to occupy another foot, and take in a wider range of judgment and understanding. Now, what effect has that had upon your country? From the Atlantic coast to the Rocky Mountains the pathway of the agricultural farmer has been full of destitution and destruction. I can go into New York and Pennsylvania and Iowa to-day and find farms that I would have been obliged to pay \$100 an acre in 1868, and I can buy them to-day for \$30 and \$40. What means that tremendous loss to the State? Lack of knowledge has cost in those years fifteen hundred millions of dollars in the decline of her farm values. Do you see what this means to the well-being of a state?

Now, what I have to say to you this afternoon is on a line of "Some Things in Cross Breeding."

Underlying everything in cattle-breeding is the element of temperament. To define temperament, call it an inherited tendency of function. One class of cattle inherit a tendency toward motherhood in an enlarged degree; these we define as belonging to the milk and butter temperament. Another class inherit a tendency toward flesh-making; these we define as belonging to the beef temperament. As you develop the milking temperament, you decrease the flesh-making tendency and heredity and *vice versa*. It is so in horses as between the speed temperament and the draught temperament. For fifty years the Shorthorn cattle in this country have been bred steadily to establish the beef temperament. In all that time I have never heard of a Shorthorn sire, which received a premium at a cattle show because of showing that he had inherited, or possessed the dairy form from which, it might be supposed, that he would beget cows of a dairy quality. So determined have been the Shorthorn breeders to extinguish all dairy qualities from their cattle, that they universally judge no sire to be of standard breeding that does not show in form and outline that he is of the most decided beef temperament.

Yet with all this strong determination to breed as far away from the dairy temperament as possible, our Shorthorn friends are continually talking of "Shorthorns from a milking strain."

This bold contradiction of all established principles in breeding has caused me to say what I have said for many years on this subject. Is it consistent to steer north and claim we're going south? Is it consistent to breed sires absolutely for the transmission of the beef temperament, rejecting all that show any approach to the dairy farm, and then claim that we are producing a "milking strain?"

The result of this inconsistent and illogical juggling with fixed principles of heredity is to the effect that the Shorthorn breeders have deceived themselves and have thus misled a great host of farmers throughout the land into buying beef bred sires with which to produce profitable dairy cows. These farmers wanted the best possible cow machine they could get. Dairy expense is too great to take up with any other with a hope of profit and economical production.

The organization of creameries and cheese factories all over the land makes it possible to look into this question, as well as many others, that effect the well-being of the dairy farmer. This has been done by the aid of the cow census. "Hoard's Dairyman" has been at this work for several years until its files contain a large number of these special investigations into the working of over twelve hundred herds, supplying milk to creameries for twelve months in the States of Vermont, Connecticut, New York, Pennsylvania, Ohio, Indiana, Iowa, Wisconsin and Minnesota.

In the states of New York, Ohio and Wisconsin, several of these census investigations numbering several hundred herds, in each State have been taken. The breeding of every herd, or rather cross-breeding, is given as well as the amount of milk, the butter-fat test, the final earnings per cow at the creamery and the amount of gain, or loss, for every dollar expended in feed. Also an inquiry is made as to the mental status of each farmer, his methods of management, his state of intelligence, what he reads and how he feeds his mind as well as his cattle.

From out this mass of testimony, which as yet has been but very slightly summarized, one would think at least that very valuable data could be obtained on which to build some judgment as to the pro and con of cross-breeding.

Take for instance the last cow census taken in Minnesota which has just been closed in the Dairyman, and see what it tells of this work of breeding and cross-breeding.

The one hundred herds enumerated contained an average of ten cows each, or a total of one thousand; of these, we make the following classification:

One herd pure Shorthorn; 38 herds grade Shorthorn; one herd of Jerseys, 9 herds of Jersey and Shorthorn cross-bred; 9 herds Holstein and Shorthorn cross-bred; 4 herds of Guernsey and Shorthorn cross-bred; 2 herds Brown Swiss and Shorthorn cross-bred; one herd Shorthorn and Red Poll cross-bred; 2 herds of Shorthorn and Hereford cross-bred, and 20 herds of so-called "natives;" one herd classified as "mixed," which I have placed with the "natives," making 21 in this classification.

The records show in this practical creamery work that of the 38 herds of Shorthorn grades, 14 of them made a loss at the creamery ranging from 32 cents per cow to \$10.51, or an average loss per cow of \$3.79.

The remaining 24 herds of grade Shorthorns made a gain at the creamery, ranging from \$1.70 to \$24.18 per cow. The average profit per cow of the 24 herds was a fraction over \$110.26. The pure-bred Shorthorn herd gave a loss of \$5.20 per cow.

There was one herd of Jerseys numbering eleven cows which showed a profit of \$19.72 per cow; 2 herds of Grade Jersey and Shorthorn cross that gave a loss respectively of \$5.18 and \$7.68 per cow. The seven remaining herds of this breeding, made a gain respectively of \$2.61 to \$30.63 per cow.

There were nine herds of the Holstein and Shorthorn cross. Of these, two made a loss, respectively, from 46 cents to \$1.22 per cow. The remaining seven herds of this breeding made a gain, respectively, from \$2.21 to \$7.44 per cow.

The nicking of Holstein and Shorthorn, by these records, does appear to be as successful as that of the Jersey and Shorthorn.

The four herds of Guernsey and Shorthorn show a loss in one herd of \$6.84 per cow and a gain in the other three from \$1.20 to \$10.65.

The two herds of the Shorthorn and Brown Swiss cross, show a gain, respectively, of \$1.80 and \$2.05 per cow. This cross does not indicate a very strong dairy prepotency on the part of the Brown Swiss sire. There was but one herd of the Shorthorn and Red Poll cross. This herd made a gain of \$19.41 which was very creditable indeed, but there were not enough herds of this breeding to give a comparison of tendency for breeding of temperament. The breeding on both sides of these families is strongly toward the beef-temperament.

The two herds of Shorthorn and Hereford cross both gave a loss, one of 49 cents and the other of \$2.16 per cow.

We come now to an interesting study of the universal cow of this country, so called the "native."

The twenty-one herds classed as "natives" gave results as follows: Ten herds showed a loss ranging from 83 cents to \$6.61 per cow, or an average loss for the ten herds of \$3 per cow.

The remaining 11 herds showed a gain ranging from \$3.46 with the highest score in the one hundred herds, that of \$37.85 per cow.

So far as we can learn this herd was constructed and brought to its present state of good profit by the owner being a good judge of cows in purchasing, and following that up by a most excellent understanding of how to care for and feed a cow after he got her. Of course added to this was the process of elimination, or weeding out of poor cows, which is one of the most important of all processes connected with the management of a dairy herd.

There does not appear to be any demonstration of breeding skill on the part of this owner, nor could there well be considering that he was dealing with a herd of native cattle, which derived their heredity from the hit-or-miss practice of the average farmer.

We can see, however, that this man would make a successful breeder should he attempt it, for he evidently has a large amount of what we might call "cow-sense" or understanding.

At the outset, I spoke of temperament in cattle. A number of years ago in reasoning on certain things that I found in my studies in cattle-breeding, I was obliged to give a name to this element of inherited tendency, which I called "temperament."

The breeder, if he thoroughly comprehends the scope of his purpose and work, is all the time striving to enlarge by skilfull mating this element of temperament in every succeeding generation. If a dairy animal is bred, he wants it more and more developed in this direction through every successive mating. If a trotting horse or a draught horse is bred, the same principle will apply. Without this definite purpose of constant enlargement of the basic temperament, there can be no definite progress made in breeding.

Therefore, we are wise if we study the power and limitations of temperament. From it we will learn, never to unite or mate two animals of opposing temperament or tendency. We must study as much as possible, to enlarge the stream of temperament, not divide or dissipate it.

We must breed dairy temperament of an agreeing prepotency together as much as possible. For instance, the Holstein has a powerful prepotency towards a large quantity of milk with a small fat globule and a comparative low proportion of butter-fat. Those traits are as strongly inherited as are its color.

The Jersey and Guernsey families have just as strong an inherited tendency or prepotency towards a smaller quantity of milk flow with a much larger fat globule and a larger per cent. of butter-fat.

Is it a good exercise of breeding skill to attempt to unite in one animal such strong and widely dissimilar tendencies? Do they usually nick well, and to the purpose of making a better cow therefor? I think not.

With the Ayrshire cow and particularly the Ayrshire grade, the female comes so far this way from the rigid prepotent line as above indicated, as to very successfully nick with the Jersey or Guernsey. At least such has been the verdict of actual facts and experience in such breeding. If I were to arrange these forces that we are dealing with so constantly, and I may say many times so blindly, I

would state them as follows: (1) Temperament, (2) Function, (3) Form.

We should breed primarily for temperament. Keep it as clear, unclouded and strong as possible. To that end, we must have a strong judgment of the prepotent power of the sire when we select him; on our wisdom in this particular, depends almost everything that follows.

Temperament when acting free and unhampered by other opposing tendencies establishes function. Then function establishes form.

So in seeking to know temperament, whether it is of the kind we want, we reason back from form to function and finally to the bed-rock cause of all, which is temperament.

Now, I want to say a word or two on the question of constitution. That is one of the most important things for you to think about. The most reasonable theory for determining constitution I have ever seen is the structure of the abdomen. Men will tell you that wide between the lungs, between the fore legs, deep belly, great lung capacity and heart capacity. There is good sound reasoning. Constitution in the dairy cow is not exposure to the cold, it is the ability to endure the exhaustive work of large milk production, to hold up under it. What is the meaning of constitution? The meaning of constitution in the race horse is ability to endure to the end of the race. The meaning in the draft horse is the ability to endure the heavy pulling. So that in the old law of logic of life, never compare things that differ. Define constitution in every instance by the character of the function, and if it does not sustain itself within the function then it is lacking in constitutional vigor. Breed for it. Always breed for it, but do not breed for one kind of constitution when you are needing another in the animal by a different function.

PROFITABLE CATTLE.

BY HON. B. O. COWAN.

Vegetarianism has its earnest advocates who can adduce strong arguments to prove that mankind would live longer and be better if they were less carnivorous, yet despite these arguments the world will move on in the even tenor of its way and the great mass of mankind will continue to eat meat to the extent of their ability to procure it. I have no disposition to carry the discussion of this question further than to say that the meat consuming nations of the earth have done most for the civilization and development of the world. Hence it may not have been altogether race and national pride which prompted William M. Thackeray to say, "This is the meat that I would eat were I to do battle with any mortal foe. Fancy a hundred thousand Englishmen after a meal of stalwart beef ribs, encountering a hundred thousand Frenchmen who had partaken of a trifling collation of soup, carrots, onions and Gruyere cheese." While mutton, pork and poultry will continue to be an important part of the meat supply of the world, beef is and ever

will be the great staple. In relation to other edible meats, beef occupies much the same ratio as corn to other cereals. Hence, to a convention of earnest investigating live stock breeders the question of the enlargement and improvement of the meat supply and an adequate and remunerative market for it, is of more vital interest than to speculate on the probable result of a contest between an army fed on prime beef and one filled with roots and cereals.

When one reads of the enormous receipts of live stock at our market centers, the impression is likely to result that the supply is out-stripping the demand. During 1905 nearly 17,000,000 cattle, sheep and hogs were received at the Union Stock Yards at Chicago, being an increase over the receipts of 1904 of more than 1,100,000 head. But while the increase in the meat supply has been very large, the belief is held by many well-informed stockmen that the population of the world is increasing at a more rapid rate than its meat supply. It would be difficult to prove this theory by statistics in our own country alone, owing to the uncertainty and apparent inaccuracy of estimates of cattle prior to 1901, at which time a different and, we hope, more accurate system of taking the enumeration of cattle was inaugurated. In 1878 when our population was about 48,000,000, we had 30,000,000 cattle, or about 630 cattle to each 1,000 of population. This number increased annually by one to three million head until 1893, when 54,067,590 were reported. From that time our stock of cattle decreased until 1900 when but 43,900,000 were enumerated. The estimate of 1901, under the new system of taking cattle census, shows an enormous increase, raising the number from 43,900,000 to 67,000,000. The increase of over 23,000,000 in one year gives ground for doubting the accuracy of former estimates. From 1902 the enumeration has shown no great change in the number of cattle, and in 1905 61,240,000 were reported. But whether this increased ratio of population over that of cattle can be proven in our own country, it can be easily established in the more densely populated countries of Europe, and while the meat supply is capable of immense expansion, the hungry mouths of the world's teeming millions are also rapidly increasing and are demanding food. But with any country that produces more than its own people can consume, the question of supreme importance is a foreign market, and the prices at which the surplus can be sold in a foreign market fixes, in a large measure, the value of the product put on the domestic market, and when the export demand is restricted or destroyed, loss and disaster are sure to result. This axiom of trade cannot be too strongly emphasized. During past years the foreign demand has taken a considerable portion of our surplus products of grain and meats, but the certainty of having German and other European markets closed against us presents a crisis that should interest the entire agricultural class of America. It is a condition, and a profoundly serious one, that confronts us. The German government has officially informed the United States that the agreement whereby we can export our products at the minimum tariff rate will cease March 1st unless a reduction be made in our tariff rates. In other words, Germany believes in reciprocity that reciprocates. While our trade with Germany has not been so large as with Great Britain, yet it has been considerable, and has absorbed a large portion of our surplus. We have been selling Germany,

annually about \$200,000,000 of products, and have bought from her only \$100,000,000. With a reasonable and just modification of our tariff rates, which can be made without detriment or loss to our own people, our trade with Germany and other Continental nations could be very largely increased.

Because of decreased supply, beef and pork in Germany are selling at fabulous prices, while in the United States there is a surplus seeking market at very low prices. Speaking of this situation, Hon. W. A. Harris, former Senator from Kansas, said "Never was the time so opportune for effecting a commercial treaty with our German friends as the present. The situation in the empire is most critical, the country being involved in a meat famine, the proportions of which have astounded the whole world. Records show that in one year 12,000 horses were slaughtered in Berlin alone for food, and 79,000 were consumed in Prussia for the same year. These horses were not young animals, but old harness ridden beasts, in practically all cases discarded tramway horses." With trade restrictions, it seems the acme of folly to refuse to make a reasonable concession and so lose what trade we have. Senator Cullom, chairman of the Committee on Foreign Relations, in the House of Representatives, has publicly advocated the modification of our tariff rates so as to provide for a maximum and minimum tariff. He gives counsel which should be heeded by our Congress in considering this grave crisis. He says, "We must not go about this matter in the spirit of retaliation. Germany and other countries have the right to adjust their tariff systems to suit their own individual interests. We never have hesitated to exercise that right for ourselves. The tariff is necessarily a selfish affair. We should fix our duties in such a way as to further our own interests both at home and abroad. We want to build up American industries in America, but we cannot do that successfully unless we also build up American trade abroad. There is not the slightest prospect of the adoption of any arbitrary system of reciprocity or the successful negotiation and ratification of any general reciprocity treaties at the present time. If we are not in a position to give Germany or other countries some concessions in return for concessions we demand from them, we shall get the worst of the bargain. Germany can force us to pay maximum rates on goods we send into that country, but Germany will continue to pay our regular rates all the time. We have no weapon to compel her to give us the minimum rate."

The Pioneer Breed.

The topic, "Profitable Cattle," assigned me by your program gives field for wide discussion. The necessity of crop rotation to conserve the fertility of the soil was learned long ago by those who were wise enough to learn from experience, and that necessity has been strongly emphasized by our agricultural colleges. Coupled with crop rotation, is an agricultural axiom that has not been sufficiently understood by some grain growing sections of our country, viz., no system of agriculture can be permanently successful unless it is founded on the production of live stock. And while there are several breeds of both dairy and beef cattle that can justly lay claim to being profitable cattle, I shall, in this discussion, consider only the beef cattle.

The pioneer breed of beef cattle, and the one most widely dis-

tributed, is the Shorthorn. The breed had its origin during the 18th century, in the North of England, in the Counties of Durham, York, Lincoln and Northumberland—early known as North Umbria. They were known as Durhams, Teeswater cattle, from the river Tees, and Shorthorn as distinguished from the Longhorn cattle to which they were the more worthy successors. As the Anglo Saxon race is the blending of the best elements of several nationalities that successively ruled and plundered England for centuries, so the Shorthorn breed of cattle represents the commingling of the best boviné blood of the kingdom, which was intensified and improved by intelligent husbandmen, and soon became, and has continued to be the leading breed of the world. Some importations of these cattle were made to the American colonies during the latter part of the 18th century, but during the first half of the 19th century these importations became numerous, and many of these improved cattle found their way into New York, Pennsylvania, Virginia, and then to Kentucky, Ohio and on to Mississippi Valley. As the fame of these excellent cattle spread, the demand for them increased rapidly and consequently their value rose. As early as 1810 Chas. Colling sold 47 head at public sale for an average of \$735, one bull selling for \$5,000, and two cows at \$2,000 each. Sales, both public and private, continued with varied success until they reached a climax during the decade from 1865 to 1875. In 1857 an importation was made into Illinois and sold at Springfield at an average of \$1,165, and in 1875 J. H. Pickrell, former Secretary of the American Shorthorn Breeders' Association, sold 23 head at Decatur, Illinois for an average of \$1,265, and at this price Mr. Pickrell felt the bidders had robbed him. September 2, 1875, Mr. Torr sold 85 head in England at the remarkable average of \$2,869, and four days later Lord Dunmore sold 39 head for an average of \$3,829, and sold the bull, Duke of Connaught for 4,500 guineas, equal, at that time, to \$26,900 American money. But the sensational sale of all bovine history was made at New York Mills, September 10, 1873, where the bidders lost their heads and afterward their money. At this sale 109 head sold for an average of \$3,504, and one cow brought \$40,600.

As the Shorthorns became scattered through the country they soon made a wonderful improvement on the native cattle. This improvement was greatest in Kentucky and Ohio, into both of which states several importations had been made from England. The farmers of these states soon produced large number of excellent steers, that being matured and fattened then found a market in Baltimore, Philadelphia and New York, after an overland journey of 500 to 800 miles. The pioneers in this overland traffic were George and Felix, of Ohio, the former taking 68 steers across in 1805, and the latter 100 head in 1817, which he sold in Philadelphia for \$134 per head. In 1841 R. R. Seymour drove 840 fat steers to Philadelphia, and between these dates mentioned many droves were taken to seaboard markets. Owing to the condition of the country and the profusion of wild grasses it was possible for cattle to make this long journey and arrive in condition of prime beef, at least for that time. The long journey was made by big well-formed steers from 4 to 6 years old, lazily cropping the succulent grasses which grew in rich profusion everywhere, and slaking their thirst in the bubbling springs and clear fresh rivulets with which the country was abun-

dantly supplied. The custom of the feeders and the condition of the markets of that day called for a far different class of beeves from what is required now. In 1855 Mr. B. F. Harris, of Champaign, Illinois, sold on the Chicago market 100 grade Shorthorn steers that averaged 2,377 pounds and brought \$7 per cwt.

Injury by Crazes.

During more than 60 years Shorthorn breeders had the American continent as a field of operation, untrammelled by fear of successful rivalry. And had they only pursued the conservative, helpful policy toward each other that has been observed in recent years, Shorthorns would to-day have fewer and less successful rivals. At the time when the importation of rival breeds was being started, many Shorthorn breeders were intensifying the blood of their herds to a dangerous degree by in-breeding and too close line breeding, and were depreciating many valuable herds by the creation and circulation of reports about objectionable and unfashionable crosses, and in some instances manifested more zeal in tearing down the herds of fellow breeders than in building up their own. During this period much bitterness between breeders was engendered and prejudices against several families of Shorthorns were started that have done incalculable harm to the breed. Tribes that had produced noted prize winners and most excellent sires were driven from positions of great popularity by objections which, in many cases, had no real foundation. The effect of this senseless crusade against so-called "unfashionable crosses" was to greatly restrict breeders in the selection of herd bulls, and some of the very best bulls of the breed were not used because of this prejudice. This was followed by a "color craze" during which no breeder dared to use a white bull in his herd, and very few had the courage to use roans. The prejudice sent many white and roan bulls of outstanding merit to the feed lots, and so restricted breeders in the choice of herd bulls. It was during this period when the Shorthorn breed was assailed from within by jealousies of its advocates, the color craze and unfashionable crosses, that it met the first organized opposition from without by the importation of rival breeds.

Owing to their early importation to this country their wide distribution and great popularity, Shorthorns have moulded the character of the cattle of our country as no other breed has been able to do. And this splendid foundation, laid in thousands of graded herds, was built upon by the Herefords or Angus, and some of the cross-bred champions that have brought renown to rival breeds, would in an untimate analysis, show considerable Shorthorn blood.

During the fat stock shows held some years ago, Shorthorn steers were champions in nearly all contests. During the International Shows for five years the champion steers have been from other breeds. This, however, must not be taken to indicate a retrograde in Shorthorns. At the shows of breeding stock, Shorthorns have grown stronger year by year, but very few breeders have given attention to the preparation and exhibition of steers, and particularly of the better class of steers. This work has been undertaken with judgment and great zeal by the other breeds, and success has crowned their efforts.

The Shorthorn's Claims.

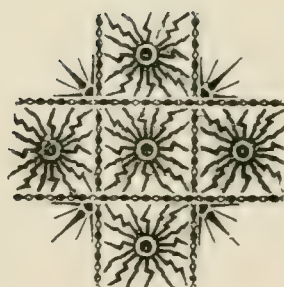
The specific claim of superiority made for Shorthorns is that they come nearer answering every purpose of the farmer and stock grower than any other breed. They are surpassed by none in the produce of edible beef, while in the production of milk Shorthorn cows surpass all beef breeds. In scale they are generally conceded to lead their rivals, and in the Xmas issue of the *Breeders' Gazette*, Mr. John Clay stated that ranchmen who had been using Hereford bulls would be compelled to return to the use of Shorthorns to increase the size of their cattle.

Gentlemen, you have been entertained and entertained admirably by the speaker who preceded me, and who, according to his standard has forever put to sleep any claim that the Shorthorn breeder might make for her as a dual purpose animal. Now, I recognize this fact; that the specialist will succeed in his line. The physician who, after laying a broad foundation as a means of education takes a special course, specializes and prepares himself in some particular line of work will, of course, outstrip in that particular work men who are not specialists. We recognize the fact that the man who attempts to produce the highest type of beef animal, the highest type of dairy animal in the same animal will inevitably fail. That far I endorse what has been said, and endorse it most heartily. We accord to the dairy breed supremacy as dairy cattle, but we do not accord to the beef breeds supremacy in the ultimate test for the beef cattle; but while we accord to the dairy production of butter fat, I cannot and will not admit that it is absolutely impossible to have a dual purpose animal and to have a successful dual purpose animal. I want to saw that a man cannot produce a beef animal that will go to our great contests and there meet the test of the opposing breed and win the prize if he attempts to have that cow give milk. It would be folly, and yet, as a matter of experience as a Shorthorn breeder and as a man who has produced winners in Shorthorn contests, I say it is possible to take an animal, the beef animal that is a remarkable milk producer, and take that animal and make it a winner in a beef contest. I have in my mind now a pair of Shorthorn heifers which I exhibited as calves and as yearlings all over the shows of the West and those two heifers took first and second in every contest in which they entered. They were relegated to the breeding herd at two years of age, and were not shown. One of those was one of the finest milk producers ever in my herd, and while I patronize the creameries I say to the producers, and I say here, that Shorthorn cow when her calf was three weeks old produced from four to five gallons of milk per day more than that calf took. Is that not a dual purpose cow? Can you point to very many of your own dairy cows that send their butter-fat to the creamery who will equal the record of that cow?

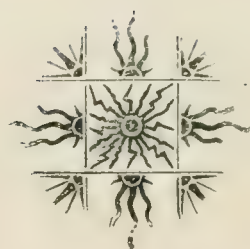
MR. LANTZ: Did she keep it up after her calf was six months old?

MR. COWAN: I took her to the state fairs and in contest with other cows won \$370 for her milk production when her calf was six months old. That is milking at least successfully a good length of time. Now, don't understand me to claim the Shorthorn as a dairy cow any supremacy to the dairy breeds. I make no such claim, and the breeders make no such claim. But the Shorthorn breeders of this country do make the claim that they have a dual purpose animal and

a successful dual purpose animal, one that in point of beef production is surpassed by none, and in the production of milk is a very creditable animal. I give due credit to all that has been said, but I protest, and I desire to protest with all the emphasis that is possible for me to put into words, to the statement that it was absolutely impossible and silly and fallacious to talk about an animal that is a successful dual purpose animal. Let me point you to-day to the dairy cattle of England, and from what breeds do they come? The dairy cattle of Great Britain to-day are taken largely from the Shorthorn breed, and you can go to the dairies of that country and successfully establish the fact that what I am claiming here is correct. I will admit what Gov. Hoard has said, that many Shorthorn breeders have bred out of their cattle the ability to make successful cows. In other words they have intensified the beef producing qualities of their cattle and at the expense of the dairy qualities. But in spite of all that, in spite of the fact that they have overbred as beef cattle, we have to-day numerous instances where we can point them out herds in this state and in New York that are making a very creditable exhibit as milk producing cows. Now, then, we want to be charitable. I give to other breeds every just claim that they can present in favor of their cattle. I want to say here, that the man who attempts to succeed by misrepresentation of his fellows in the race for life is not doing them justice. I do not, of course, refer to anything that has been said here to-day. I make that as a general statement; that we want to be generous to our rivals, we want to accord them just merit of the cattle they are defending.



APPENDIX.



APPENDIX.

LIST OF PUBLICATIONS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

ANNUAL REPORTS.

- *Report of the State Board of Agriculture, 336 pages, 1877.
- *Report of the State Board of Agriculture, 625 pages, 1878.
- *Report of the State Board of Agriculture, 560 pages, 1879.
- *Report of the State Board of Agriculture, 557 pages, 1880.
- *Report of the State Board of Agriculture, 646 pages, 1881.
- *Report of the State Board of Agriculture, 645 pages, 1882.
- *Report of the State Board of Agriculture, 645 pages, 1883.
- *Report of the State Board of Agriculture, 648 pages, 1884.
- *Report of the State Board of Agriculture, 645 pages, 1885.
- *Report of the State Board of Agriculture, 646 pages, 1886.
- *Report of the State Board of Agriculture, 650 pages, 1887.
- *Report of the State Board of Agriculture, 648 pages, 1888.
- *Report of the State Board of Agriculture, 650 pages, 1889.
- *Report of the State Board of Agriculture, 594 pages, 1890.
- *Report of the State Board of Agriculture, 600 pages, 1891.
- *Report of the State Board of Agriculture, 640 pages, 1892.
- *Report of the State Board of Agriculture, 713 pages, 1893.
- *Report of the State Board of Agriculture, 646 pages, 1894.
- *Report of the Department of Agriculture, 878 pages, 1895.
- *Report of the Department of Agriculture, Part 1, 820 pages, 1896.
- *Report of the Department of Agriculture, Part 2, 444 pages, 1896.
- *Report of the Department of Agriculture, Part 1, 897 pages, 1897.
- *Report of the Department of Agriculture, Part 2, 309 pages, 1897.
- *Report of the Department of Agriculture, 894 pages, 1898.
- *Report of the Department of Agriculture, Part 1, 1082 pages, 1899.
- *Report of the Department of Agriculture, Part 2, 368 pages, 1899.
- *Report of the Department of Agriculture, Part 1, 1010 pages, 1900.
- *Report of the Department of Agriculture, Part 2, 348 pages, 1900.
- *Report of the Department of Agriculture, Part 1, 1040 pages, 1901.
- *Report of the Department of Agriculture, Part 2, 464 pages, 1901.

*Note.—Edition exhausted.

- *Report of the Department of Agriculture, Part 1, 1030 pages, 1902.
- *Report of the Department of Agriculture, Part 2, 324 pages, 1902.
- Report of the Department of Agriculture, 958 pages, 1903.
- Report of the Department of Agriculture, 790 pages, 1904.
- Report of the Department of Agriculture, 846 pages, 1905.

BULLETINS.

- No. 1.* Tabulated Analyses of Commercial Fertilizers, 24 pages, 1895.
- No. 2.* List of Lecturers of Farmers' Institutes, 36 pages, 1895.
- No. 3.* The Pure Food Question in Pennsylvania, 38 pages, 1895.
- No. 4.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
- No. 5.* Tabulated Analyses of Commercial Fertilizers, 38 pages, 1896.
- No. 6.* Taxidermy; how to collect Skins, etc., 128 pages, 1896.
- No. 7.* List of Creameries in Pennsylvania, 68 pages, 1896.
- No. 8.* Report of State Horticultural Association, 108 pages, 1896.
- No. 9.* Report of Dairymen's Association, 96 pages, 1896.
- No. 10.* Prepared Food for Invalids and Infants, 12 pages, 1896.
- No. 11.* Tabulated Analyses of Commercial Fertilizers, 22 pages, 1896.
- No. 12.* Road Laws for Pennsylvania, 42 pages, 1896.
- No. 13.* Report of Butter Colors, 8 pages, 1896.
- No. 14.* Farmers' Institutes in Pennsylvania, 92 pages, 1896.
- No. 15.* Good Roads for Pennsylvania, 42 pages, 1896.
- No. 16.* Dairy Feeding as Practiced in Pennsylvania, 126 pages, 1896.
- No. 17.* Diseases and Enemies of Poultry, 128 pages, 1896.
- No. 18.* Digest of the General and Special Road Laws for Pennsylvania, 130 pages, 1896.
- No. 19.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1896.
- No. 20.* Preliminary Report of Secretary, 126 pages, 1896.
- No. 21.* The Township High School, 24 pages, 1897.
- No. 22.* Cider Vinegar of Pennsylvania, 28 pages, 1897.
- No. 23.* Tabulated Analyses of Commercial Fertilizers, 31 pages, 1897.
- No. 24.* Pure Food and Dairy Laws of Pennsylvania, 19 pages, 1897.
- No. 25.* Farmers' Institutes in Pennsylvania, 8 pages, 1897.
- No. 26.* Farmers' Institutes in Pennsylvania, 74 pages, 1897.
- No. 27.* The Cultivation of American Ginseng, 23 pages, 1897.
- No. 28.* The Fungous Foes of the Farmer, 19 pages, 1897.
- No. 29.* Investigations in the Bark of Trees, 17 pages, 1897.
- No. 30.* Sex in Plants, 17 pages, 1897.
- No. 31.* The Economic Side of the Mole, 42 pages, 1898.

- No. 32.* Pure Food and Dairy Laws, 30 pages, 1898.
- No. 33.* Tabulated Analyses of Commercial Fertilizers, 42 pages, 1898.
- No. 34.* Preliminary Report of the Secretary, 150 pages, 1898.
- No. 35.* Veterinary Medicines, 23 pages, 1898.
- No. 36.* Constitutions and By-Laws, 72 pages, 1898.
- No. 37.* Tabulated Analyses of Commercial Fertilizers, 40 pages, 1898.
- No. 38.* Farmers' Institutes in Pennsylvania, 8 pages, 1898.
- No. 39.* Farmers' Institutes in Pennsylvania, 88 pages, 1898.
- No. 40.* Questions and Answers, 206 pages, 1898.
- No. 41.* Preliminary Reports of the Department, 189 pages, 1899.
- No. 42.* List of Creameries in Pennsylvania, 88 pages, 1899.
- No. 43.* The San José and other Scale Insects, 22 pages, 1899.
- No. 44.* Tabulated Analyses of Commercial Fertilizers, 62 pages, 1899.
- No. 45.* Some Harmful Household Insects, 13 pages, 1899.
- No. 46.* Some Insects Injurious to Wheat, 24 pages, 1899.
- No. 47.* Some Insects Attacking Fruit, etc., 19 pages, 1899.
- No. 48.* Common Cabbage Insects, 14 pages, 1899.
- No. 49.* Methods of Protecting Crops, etc., 20 pages, 1899.
- No. 50.* Pure Food and Dairy Laws of Pennsylvania, 33 pages, 1899.
- No. 51.* Tabulated Analyses of Commercial Fertilizers, 69 pages, 1899.
- No. 52.* Proceedings Spring Meeting of Round-up Meeting, Farmers' Institute Managers, etc., 296 pages, 1899.
- No. 53.* Farmers' Institutes in Pennsylvania, 1899-1900, 94 pages, 1899.
- No. 54.* Tabulated Analyses of Commercial Fertilizers, 163 pages, 1899.
- No. 55.* The Composition and Use of Fertilizers, 126 pages, 1899.
- No. 56. Nursery Fumigation and the Construction and Management of the Fumigating House, 24 pages, 1899.
- No. 57. The Application of Acetylene Illumination to Country Homes, 85 pages, 1899.
- No. 58. The Chemical Study of the Apple and Its Products, 44 pages, 1899.
- No. 59. Fungous Foes of Vegetable Fruits, 39 pages, 1899.
- No. 60.* List of Creameries in Pennsylvania, 33 pages, 1899.
- No. 61.* The Use of Lime in Pennsylvania Soils, 170 pages, 1900.
- No. 62. A Summer's Work Abroad in School Grounds, Home Grounds, Play Grounds, Parks and Forests, 34 pages, 1900.
- No. 63. A Course in Nature Study for Use in the Public Schools, 119 pages, 1900.
- No. 64. Nature Study Reference Library for Use in the Public Schools, 22 pages, 1900.
- No. 65. Farmers' Library List, 29 pages, 1900.
- No. 66.* Pennsylvania Road Statistics, 98 pages, 1900.
- No. 67. Methods of Steer Feeding, 14 pages, 1900.
- No. 68.* Farmers' Institutes in Pennsylvania, 90 pages, 1900.
- No. 69.* Road Making Materials of Pennsylvania, 104 pages, 1900.

No. 70.* Tabulated Analyses of Commercial Fertilizers, 97 pages, 1900.

No. 71. Consolidation of Country Schools and the Transportation of the Scholars by Use of Vans, 89 pages, 1900.

No. 72.* Tabulated Analyses of Commercial Fertilizers, 170 pages, 1900.

No. 73. Synopsis of the Tax Laws of Pennsylvania, 132 pages, 1901.

No. 74.* The Repression of Tuberculosis of Cattle by Sanitation, 24 pages, 1901.

No. 75.* Tuberculosis of Cattle, and the Pennsylvania Plan for its Repression, 262 pages, 1901.

No. 76. A Co-operative Investigation into the Agricultural Seed Supply of Pennsylvania, 50 pages, 1901.

No. 77.* Bee Culture, 101 pages, 1901.

No. 78.* List of County and Local Agricultural Societies, 10 pages, 1901.

No. 79. Rabies, 28 pages, 1901. ,

No. 80.* Decisions of the Department of Agriculture on the Pure Food Act of 1895, 20 pages, 1901.

No. 81.* Concentrated Commercial Feeding Stuffs in Pennsylvania, 136 pages, 1901.

No. 82.* Containing the Law Creating a Department of Agriculture in Pennsylvania, and Giving the Various Acts of Assembly Committed to the Department for Enforcement; Together with Decisions and Standards Adopted with Reference to the Pure Food Act of 1895, 90 pages, 1901.

No. 83.* Tabulated Analyses of Commercial Fertilizers, 132 pages, 1901.

No. 84. Methods of Steer Feeding; the Second Year of Co-operative Experiment by the Pennsylvania State Department of Agriculture and the Pennsylvania State College Agricultural Experiment Station, 16 pages, 1901.

No. 85.* Farmers' Institutes of Pennsylvania, 102 pages, 1901.

No. 86.* Containing a Complete List of Licenses granted by the Dairy and Food Commissioner, from January 1, 1901, to July 1, 1901, etc., 422 pages, 1901.

No. 87.* Giving Average Composition of Feeding Stuffs, 42 pages, 1901.

No. 88.* List of Creameries in Pennsylvania, 33 pages, 1901.

No. 89.* Tabulated Analyses of Commercial Fertilizers, 195 pages, 1901.

No. 90. Treatment of San José Scale in Orchard and Nursery, 33 pages, 1902.

No. 91. Canning of Fruits and Vegetables, 57 pages, 1902.

No. 92.* List of Licenses Granted by the Dairy and Food Commissioner, 193 pages, 1902.

No. 93. The Fundamentals of Spraying, 35 pages, 1902.

No. 94. Phosphates—Phosphatic or Phosphoric Acid Fertilizers, 87 pages, 1902.

No. 95.* County and Local Agricultural Societies, 1902, 12 pages, 1902.

*Note.—Edition exhausted.

- No. 96. Insects Injurious to Cucurbitaceous Plants, 31 pages, 1902.
- No. 97. The Management of Greenhouses, 41 pages, 1902.
- No. 98. Bacteria of the Soil in their Relation to Agriculture, 88 pages, 1902.
- No. 99. Some Common Insect Pests of the Farmer, 32 pages, 1902.
- No. 100.* Containing Statement of Work of Dairy and Food Division from January 1, 1902, to June 30, 1902, 223 pages, 1902.
- No. 101.* Tabulated Analyses of Commercial Fertilizers, 137 pages, 1902.
- No. 102. The Natural Improvement of Soils, 50 pages, 1902.
- No. 103.* List of Farmers' Institutes of Pennsylvania, 67 pages, 1902.
- No. 104. Modern Dairy Science and Practice, 127 pages, 1902.
- No. 105. Potato Culture, 96 pages, 1902.
- No. 106. The Varieties of Fruit that can be Profitably Grown in Pennsylvania, 50 pages, 1902.
- No. 107.* Analyses of Concentrated Commercial Feed Stuffs, 62 pages, 1903.
- No. 108. The Hessian Fly in Pennsylvania, — 1903. (Not out of press.)
- No. 109.* Tabulated Analyses of Commercial Fertilizers, 208 pages, 1903.
- No. 110.* Containing Statement of Work of Dairy and Food Division from July 1, to December 31, 1902, 248 pages, 1903.
- No. 111. Small Fruits, their Origin, Culture and Marketing, 66 pages, 1903.
- No. 112.* List of County and Local Agricultural Societies, 10 pages, 1903.
- No. 113. Methods of Milking, 96 pages, 1903.
- No. 114.* Tabulated Analyses of Commercial Fertilizers, 116 pages, 1903.
- No. 115. Proceedings of Annual Meeting of Farmers' Institute Managers and Lecturers, 210 pages, 1903.
- No. 116.* Farmers' Institutes in Pennsylvania, Season 1903-1904, 64 pages, 1903.
- No. 117. Potash Fertilizers—Sources and Methods of Application, 46 pages, 1903.
- No. 118.* Containing the Laws Creating the Office of Dairy and Food Commissioner in Pennsylvania, and also a Digest of the Acts of Assembly Committed to his Administration, 62 pages, 1903.
- No. 119.* Tabulated Analyses of Commercial Fertilizers, 115 pages, 1903.
- No. 120. The Apple-tree Tent-caterpillar, 46 pages, 1903.
- No. 121. Address of Hon. Joseph W. Hunter, State Highway Commissioner, Delivered at Annual Meeting of State Board of Agriculture, January 28, 1904, 16 pages, 1903.
- No. 122.* Analyses of Concentrated Commercial Feeding Stuffs, 52 pages, 1904.
- No. 123. Chestnut Culture, 50 pages, 1904.
- No. 124.* County and Local Agricultural Fairs, 10 pages, 1904.

- No. 125. The Source and Nature of Bacteria in Milk, 41 pages, 1904.
- No. 126. Tabulated Analyses of Commercial Fertilizers, January 1, to August 1, 140 pages, 1904.
- No. 127. Farmers' Institutes in Pennsylvania, 71 pages, 1904.
- No. 128. Grape Culture, 62 pages, 1904.
- No. 129. Alfalfa Culture in Humid Land, 64 pages, 1904.
- No. 130. The Cow-pea in the North, 41 pages, 1904.
- No. 131. Proceedings, State Board of Agriculture and Farmers' Normal Institute, 260 pages, 1904.
- No. 132. Analyses of Commercial Fertilizers, August 1, to December 31, 70 pages, 1904.
- No. 133. The Improvement of Corn in Pennsylvania, 76 pages, 1904.
- No. 134. Proceedings of the Twenty-eighth Annual Meeting of the State Board of Agriculture, 152 pages, 1905.
- No. 135. Analyses of Concentrated Feeding Stuffs, 41 pages, 1905.
- No. 136. List of County and Local Agricultural Societies, 8 pages, 1905.
- No. 137. Proceedings, Spring Meeting State Board of Agriculture and Farmers' Annual Normal Institute, 216 pages, 1905.
- No. 138. Analyses Concentrated Commercial Fertilizers, January 1, to August 1, 106 pages, 1905.
- No. 139. Farmers' Institutes in Pennsylvania, 1905-1906, 93 pages, 1905.
- No. 140. Sheep Husbandry, 69 pages, 1905.
- No. 141. Laws Relating to the Dairy and Food Division, 47 pages, 1905.
- No. 142. Analyses Concentrated Commercial Fertilizers, August 1, to December 31, 61 pages, 1905.

*Note.—Edition exhausted.

FERTILIZER VALUATIONS—1905.

The object of an official valuation of commercial fertilizers is to enable the consumer to judge approximately whether he has been asked to pay for a given brand more than the fertilizing ingredients it contains and market conditions prevailing at the time would warrant. It is clear, therefore, that no attempt is made in this valuation to indicate whether the fertilizer valued possesses a greater or less crop-producing capacity than another fertilizer; but only whether it is higher priced than another of the same general composition.

For this purpose it must be so computed as to include all the elements entering into the cost of a fertilizer as it is delivered to the consumer. These elements may be conveniently grouped as follows:

1. The wholesale cost of the ingredients.
2. The jobbers' gross profit on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients, is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.
3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commission: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

The valuations for 1904 were based:

1. Upon the wholesale prices from September 1, 1903, to March 1, 1904, of the raw materials used in fertilizer manufacture, the quotations of the New York market being adopted for all materials except acidulated phosphate rock and ground bone.

2. Upon an allowance of 20 per cent. of the wholesale prices, above mentioned, to cover jobbers' profit.

By adding the 20 per cent. allowed for jobbers' gross profit to the wholesale price of the several raw materials, the retail price in original packages at the jobbers' warehouse is obtained.

Since the amount of the several valuable fertilizing constituents in the various raw materials is known, it is a simple matter to determine the corresponding retail value per pound of the valuable fertilizing constituents yielded by each raw material. A schedule of these pound values affords a convenient basis of computation of the value per ton of various fertilizers, whose composition is ascertained by analysis.

The values assigned, for the present, to the other elements in the cost of the fertilizer at the point of a delivery are:

3. For mixing, \$1.00 per ton.

4. For bagging, \$1.00 per ton, in all cases except those in which the article was sold in original packages; the cost of the package being, in such cases, included in the wholesale price.

5. For agents' commissions, 20 per cent. of the cost of the goods f. o. b. at the jobbers' or mixers' warehouse.

6. For freight, \$2.00 per ton; the cost of the freight in lots of twelve tons or over, from the seaboard to Harrisburg, averaging \$1.88 per ton.

The following valuation of dissolved South Carolina rock illustrates the method.

Phosphoric acid.	Per cent.	Weight per ton.	
Soluble,	11.50	230 lbs. at 3c.	\$6 90
Reverted,	2.50	50 lbs. at 2½c.	1 25
Insoluble,	1.00	20 lbs. at 1½c.	30
Retail cash value of ingredients,			\$8 45
Bagging,			1 00
Cash value of goods ready for shipment,			\$9 45
Agents' commission, 20 per cent.,			1 89
Freight,			2 00
Commercial value per ton,			<u>\$13 34</u>

It is not to be expected, of course, that the valuations thus computed will precisely represent the fair price to be charged for a brand in each locality and in every transaction. Market conditions, competition, distance from factory, all introduce minor variations. Nevertheless, to make the approximation reasonably close the average valuation of a given class of goods ought to agree closely with its ascertained average selling price. Whenever such an agreement is no longer obtained by the use of a schedule, it is evident that the schedule of retail values of the constituents, or the added allowances for mixing, etc., requires revision.

It is needful to note here another factor greatly affecting the practical accuracy of these approximations. Their computation would offer little difficulty and their usefulness be far greater, if, by the ordinary methods of analysis, the exact nature of the ingredients used to supply the several fertilizer constituents, were capable of certain determination. This is, however, possible, to-day, to only a limited extent. The valuations are, therefore, based on the assumption that the fertilizers are uniformly compounded from high quality ingredients, such as are commonly employed in the manufacture of fertilizers of the several classes. Consumers should carefully avoid the error of accepting such valuations as infallible; they are not designed to be used for close comparisons of single brands, but only to indicate whether the price asked for a fertilizer is abnormal, assuming good quality for the ingredients used. From this it is clear that, except as high freights may require, the selling price of a brand

should not far exceed the valuation; but that a fertilizer may be made of inferior materials and yet have a high valuation.

The valuations used during 1903 were modified for use during 1904 in accordance with the changes in wholesale prices of fertilizing ingredients and to make the valuations more closely follow the selling price.

The following comparative statement shows the valuations and selling prices of the several classes of fertilizers during 1901 to 1904:

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Spring, 1901.				
Complete,	291	24.76	23.52	0.84
Rock-and-potash,	60	14.60	16.20	-1.60
Dissolved bone,	1	29.00	28.00	1.00
Ground bone,	44	28.71	27.59	1.12
Dissolved rock,	49	13.51	13.90	-0.30
Fall, 1901.				
Complete,	179	23.75	22.28	1.47
Rock-and-potash,	42	14.23	16.09	-1.86
Dissolved bone,	5	23.55	23.91	-0.51
Ground bone,	33	27.69	25.94	1.75
Dissolved rock,	49	13.82	13.18	0.64
Spring, 1902.				
Complete,	289	25.53	24.10	1.23
Rock-and-potash,	66	15.05	16.15	-1.40
Dissolved bone,	2	17.35	16.50	.85
Ground bone,	29	26.80	28.2	-1.72
Dissolved rock,	59	13.49	13.3	-.24
Fall, 1902.				
Complete,	229	23.31	22.83	1.45
Rock-and-potash,	62	14.46	15.98	-1.52
Dissolved bone,	6	27.03	25.30	1.73
Ground bone,	27	21.5	28.00	-5.58
Dissolved rock,	56	13.70	13.47	.23
Spring, 1903.				
Complete,	365	24.29	24.57	-.28
Rock-and-potash,	82	14.13	17.20	-2.47
Dissolved bone,	3	33.87	31.17	2.30
Ground bone,	27	27.25	28.67	-1.42
Dissolved rock,	56	13.34	15.13	-1.70
Fall, 1903.				
Complete,	264	22.77	21.98	.79
Rock-and-potash,	74	14.81	15.96	-1.10
Dissolved bone,	11	24.57	23.67	.90
Ground bone,	49	21.07	27.52	-4.45
Dissolved rock,	60	13.12	14.64	-1.52
Spring, 1904.				
Complete,	349	25.07	24.28	.79
Rock-and-potash,	75	15.45	16.47	-1.02
Dissolved bone,	2	28.42	31.50	-3.08
Ground bone,	22	27.77	28.20	-.43
Dissolved rock,	41	14.06	14.59	-.53
Fall, 1904.				
Complete,	256	22.53	21.82	.71
Rock-and-potash,	63	14.92	15.89	-.97
Dissolved bone,	6	27.77	24.94	2.83
Ground bone,	38	27.97	27.02	.95
Dissolved rock,	45	14.09	13.89	.20

The general tendencies of the wholesale market may be judged from the following comparative statement, obtained from the weekly reports of the Oil, Paint and Drug Reporter, of New York

City, showing the average wholesale prices of fertilizer raw materials from September 1, 1903, to March 1, 1904, and from September 1, 1904, to March 1, 1905.

Wholesale Prices of Fertilizer Ingredients, New York, Oil Paint and Drug Reporter.

Substance.	Amount priced.	Average price September, 1903, to March, 1904.	Average price September 1, 1904, to March, 1905.	Prices September to March, 1904-5, in per cent. of prices 1903-4.
Sulphate of ammonia,	Cwt.,	3.1172	3.1367	100.6
Nitrate of soda,	Cwt.,	2.7807	2.3.16	106.0
Dried blood, H. G.,	Unit (20 lbs.),	2.5666	2.5933	101.0
Concentrated tankage,	Unit (20 lbs.),	*15.50	2.3376	.....
Rough bone,	Ton,	17.96	16.25	90.5
Bone meal,	Ton,	22.42	22.875	102.0
Fish guano, dry,	Unit (20 lbs.),	‡2.4716	‡2.543	102.8
Fish guano, acid,	Unit (20 lbs.),	‡2.2331	‡2.20	98.5
Refuse bone black,	Ton,	18.74	13.65	72.1
Phosphate rock (Charleston),	Ton,	6.00	6.00	100
Phosphate rock (Tennessee),	Ton,	3.83	3.75	97.9
Acid phosphate,	Unit (20 lbs.), ....	.6375	.6375	100
Double manure salts,	Cwt.,	1.1307	1.1340	100.3
Sulphate of potash,	Cwt.,	2.131	2.1283	99.9
Kainit,	Ton,	9.31	9.21	98.9
Muriate of potash,	Cwt.,	1.8934	1.9006	100.4
Sulphuric acid, 66 Deg. B.,	Cwt.,	1.35	1.346	99.7

*No quotations for December, January and February, per ton.
‡Bone phosphate of lime 10 cents per unit.
‡Bone phosphate of lime 35 cents per unit.

In ammoniates such as dried blood and fish guano the unit is of ammonia, of which 82.35 per cent. is nitrogen; in acid phosphates, the unit is of phosphoric acid (phosphorus pentoxid).
The nitrogenous materials, except in one or two instances, show an advance over last year's prices. Nitrate of soda and concentrated tankage show the greatest change. Bone meal and fish guano (dry) have advanced noticeably; sulphate of ammonia and dried blood, slightly; while there has been a slight decrease in the price of fish guano (acidulated) and a marked decrease in case of rough bone.
The following data are from the monthly reports of Thos. J. White & Co., fertilizer brokers, Baltimore, Md., giving wholesale quotations upon ammoniates:

Wholesale Prices of Ammoniates: Reports of Thos. J. White & Co.,
Baltimore, Md.

	Prices to September March, 1903-4.	Prices to September March, 1904-5.
Sulphate of ammonia, per cwt.,	\$3.11	3.12 1/8
Nitrate of soda,	2.125	2.289 1/2
Ground blood, f. o. b. Chicago, per unit of ammonia,	2.4 25	2.604 1/2
Concentrated tankage, f. o. b. Chicago, per unit of ammonia,	2.2 88	2.3416
Crushed tankage, c. a. f. Baltimore, per unit of ammonia:		
9 per cent. ammonia, 20 per cent. bone phosphate,	2.5752	2.575
Unground tankage, f. o. b. Chicago, per unit of ammonia:		
9 per cent. ammonia, 20 per cent. bone phosphate,		†2.17
Ground tankage, f. o. b. Chicago, per unit of ammonia:		
11 per cent. ammonia, 15 per cent. bone phosphate,	†2.3033	††2.275 1/2
7 per cent. ammonia, 20 per cent. bone phosphate, .....		| 2.10*
10 per cent. ammonia, 20 per cent. bone phosphate,		†2.35*
11 per cent. ammonia, 10 per cent. bone phosphate,		†2.45*
Hoof meal, f. o. b. Chicago, per unit of ammonia,	2.279	**2.4225

§c. i. f., Baltimore and New York.*
†Bone phosphate of lime 10 cents. September quotations lacking.
‡January and February quotations only.
††November quotations lacking.
*November quotations only.
**February quotations lacking.
||Bone phosphate of lime, 10 cents.

These quotations confirm the previous figures showing a marked increase in the price of nitrate of soda and a slight advance in case of sulphate of ammonia.

The American consumption of nitrate of soda in 1904, according to the Engineering and Mining Journal was the largest on record, 275,000 long tons, notwithstanding the high prices of \$45.26 to \$53.20 per ton.

The following summary from the "Engineering and Mining Journal" outlines the prices of rock phosphates:

Enormous consumption of phosphoric acid, both in this country and Europe, initiated active mining and improved prices. In 1904, the production of phosphates in the United States principally in Florida, South Carolina and Tennessee, amounted to approximately 1,782,503 long tons, valued at \$5,703,582.

The domestic trade, which takes little over one-half the production, showed some advance in 1904, and prices ranged from \$6.50 to \$7.50 per ton for high grade rock f. o. b. Florida ports; \$3.75 to \$4.00 for Florida land pebble; \$4.00 to \$4.25 for Tennessee export rock f. o. b. Mt. Pleasant and \$2.95 to \$4.00 for the various domestic grades; \$2.75 to \$3.50 for South Carolina rock f. o. b. Ashley River.

Quotations for January and February of this year were: for Florida land rock, \$7.25 @ \$7.50; Florida land pebble, \$3.75 @ \$4.00; Tennessee 78-80 per cent., \$4.00 @ \$4.25; Tennessee 78 per cent., \$3.75 @ \$4.00; Tennessee 75 per cent., \$3.25 @ \$3.50; South Carolina land rock, \$3.25 @ \$3.50 and South Carolina river rock, \$3.00 @ \$3.25.

Raw Materials of Acid Manufacture.—The Engineering and Mining Journal gives the following summary:

Sulphur and Pyrites.—At New York contracts for shipment of imported brimstone were made at \$21.25 @ \$22.50 for best seconds and \$20.50 @ \$22.00 for thirds.

Domestic sulphur of prime quality guaranteed 99½ per cent., sold at \$21.50 (a \$21.75 per ton f. o. b. New York, and \$21.75 @ \$22.00 at Baltimore and Philadelphia.

Domestic second guaranteed 98 per cent. pure are quoted at 30 cents lower.

As a result of decreased consumption, keen competition and low prices, trade in pyrites has been rather unfavorable.

Forty seven to 52 per cent. imported ore from Huelva, Spain, sold at seaboard points at 7.5 to 12 cents per unit (\$3.68 @ \$5.88 per ton) for fines and 9.5 to 13 cents (\$4.66 @ \$6.37) for lump ore.

Domestic ore, analyzing from 42 to 44 per cent. sulphur, was sold at 8.5 to 10 cents per unit (\$3.66 @ \$4.30 per ton) for fine and 10 to 11.5 cents (\$4.30 @ \$4.83) for lump, f. o. b. mines.

Calculated on the sulphur content, and allowing for expense of burning, consumers of pyrites are paying from 25 to 50 per cent. less than is charged for brimstone.

Sulphuric acid.—Sulphuric acid has held firm, 50 degree acid in bulk selling at \$13.50 @ \$14.50 per ton; 60 degree at \$18.00 @ \$20.00; and 66 degree at \$21.00 @ \$23.00 f. o. b. New York.

Acid in carboys is worth from \$3 to \$6 per ton more than acid in bulk.

Potash Salts.—The reports of the U. S. Bureau of Statistics show the following entries for consumption during the fiscal years 1903 and 1904.

	1903.	1904.
Muriate (pounds),	172,838,780	161,503,735
Kieserit, kainit, etc.,	247,266	158,984

This trade is so managed that before March 1, nearly all whole-sale deliveries of the year are contracted for. Market reports state that, owing to competition of independent miners, the German Potash Syndicate has offered especially attractive terms for five-year contracts. The schedule of prices on the basis of large lots sold through brokers and delivered at Boston, New York or Philadelphia, is as follows:

Salt.	February, 1905.	After March 1, 1905.
Muriate, 80 per cent., per 100 pounds,	1.885	1.915
Sulphate, 48 per cent. potash, per 100 pounds,	2.17	2.20
Double manure salt, 48-50 per cent., per 100 pounds,	1.15	1.18
Kainit, 12.4 per cent., actual potash, per ton,	8.25	8.50
Manure salt, 20 per cent. potash, per ton,	14.68	15.08

Composition of Raw Materials.—In order to form a correct idea of the cost per pound of the fertilizer constituents of these materials, it is needful to determine their composition or, in other words, the quantities of valuable constituents each contain. The following table shows the composition of the raw materials used in the manufacture of fertilizers. No analyses of these materials, with the exception of ground bone and dissolved rock, have been made in Pennsylvania. The figures in the following table include the averages of the results of analyses made in Connecticut and Massachusetts during the past year, except in the case of ground bone and dissolved rock phosphates, where Pennsylvania results alone are included.

Composition of Non-Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Nitrogen.	Potash.	Total phosphoric acid.
Sulphate of ammonia,	1	20.20	.....	.....
Nitrate of soda,	20	15.48	.....	.....
Dried blood,	4	10.40	.....	.....
Ground bone,	60	3.02	.....	22.72
Tankage,	4	7.32	.....	9.07
Ground fish,	8	8.56	.....	7.78
Cotton seed meal,	114	7.13	1.90	3.15
Castor pomace,	2	4.65	1.00	1.90
Sulphate of potash, high grade,	5	.....	49.09	.....
Muriate of potash,	16	.....	50.21	.....
Kainit,	2	.....	12.94	.....
Double sulphate of potash and magnesia,	5	.....	28.12	.....

Composition of Acidulated Fertilizer Ingredients. (Per cent.)

	Number of samples analyzed.	Total phosphoric acid.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.
Dissolved bone-black,	1	16.24	10.35	3.96	1.93
Dissolved bone,*	9	15.29	3.00	5.60	6.69
Dissolved rock phosphate,	86	15.90	9.70	4.60	1.60

*Also contains 3.54 per cent. nitrogen.

Cost per pound of Fertilizer Constituents.—With the composition of these raw materials and their price per ton, hundred weight, or other unit of measure as a basis, the wholesale cost per pound of the valuable constituents can be readily calculated. In many cases the ammoniates are quoted “per unit of ammonia,” the term unit being equivalent to per cent.; good sold by the ton of 2,000 lbs., the unit is equal to 20 lbs., and 20 lbs. of ammonia contain 16.47 lbs. of nitrogen.

In the case of refuse bone-black, unacidulated, the mean, 28.25 per cent. of phosphoric acid, is assumed to represent the average material on the market.

Phosphate rock is sold by the ton of 2,240 lbs., and on the basis of the bone phosphate of lime it contains, with drawbacks for injurious constituents. Bone-phosphate of lime contains 45.8 per cent. of phosphoric acid; therefore, each per cent. of bone-phosphate in a long ton is equivalent to 22.4 lbs. and contains 10.26 lbs. of phosphoric acid.

In the wholesale trade, dried blood, azotine, concentrated tankage and hoof meals are usually sold on the basis of ammonia, disregarding the phosphoric acid present.

Insoluble phosphoric acid in dissolved rock is likewise omitted from consideration, contracts being based solely upon the "available" phosphoric acid; nor in rock phosphates is any claim made for the small quantities of nitrogen and potash they contain, nor in dissolved bone for the potash present.

Under these conditions, the wholesale cost per pound in New York of the valuable constituents of such materials as furnish but a single fertilizing element, these materials being assumed to be in the state of preparation and in the packing in which the manufacturer purchased them, are given in the following table; also, a figure representing a fair retail price at the factory, the materials having undergone no change in treatment or packing and the allowance for expenses and profit in retailing being 20 per cent.

Wholesale Cost Per Pound of Fertilizer Constituents. (New York.)

I. Ingredients Supplying One Constituent.

Material.	Constituent valued.	Wholesale price—cents.	Wholesale price plus 20 per cent.
Sulphate of ammonia,	Nitrogen,	15.05	18.06
Nitrate of soda,	Nitrogen,	14.93	17.92
Dried blood, high grade,	Nitrogen,	15.75	18.90
Concentrated tankage,	Nitrogen,	14.22	17.06
Refuse bone black,	Phosphoric acid, total,	2.42	2.90
Phosphate rock:*			
Tennessee, 78 per cent.,	Phosphoric acid, total, .....	.484	.581
South Carolina, 60 per cent.,	Phosphoric acid, total, .....	.548	.658
Acid phosphate,	Phosphoric acid, available,	3.19	3.83
Double manure salts,	Potash,	4.43	5.32
Sulphate of potash,	Potash,	4.52	5.42
Muriate of potash,	Potash,	3.75	4.50
Kainit,	Potash,	2.97	3.56

*The prices of phosphate rock are f. o. b. at the respective points of shipment, not New York, and are taken from the reports of the Engineering and Mining Journal. The prices for potash are taken from the schedule of the syndicate. The prices for concentrated tankage are taken from the reports of Thos. J. White & Co., and those of the remainder from the Oil, Paint and Drug Reporter.

The quotations for bone are given without specific reference to quality, so that it is impossible from these data to fairly apportion their several wholesale values to the nitrogen and phosphoric

acid contained in this material. As compared with tankage, the general tendency is to assign a higher commercial rating to the phosphoric acid in bone and to the nitrogen a rating not very different from that given in tankage. The quotations of Thos. J. White & Co., show an average wholesale rate in Baltimore during September, 1904, to March, 1905, for crushed tankage to have been 2.575 per unit of ammonia and \$0.10 per unit of bone phosphate of lime. This is equivalent to \$3.13 per unit of nitrogen and \$0.218 per unit of phosphoric acid. The average composition of the ground bone and bone meal samples analyzed last fall in Pennsylvania was: Phosphoric acid, 23.62 per cent.; nitrogen, 2.95 per cent. The prepared bone contains less fat and moisture and often less nitrogen than the ordinary "rough bone," but these differences tend, in a manner, to neutralize each other.

Assuming for the rough bone quoted in the New York market the same composition as the bone meal sold in Pennsylvania and for the value of the nitrogen \$3.13 per unit, the values per pound of the several constituents would be:

Wholesale Cost per Pound of Fertilizer Constituents, New York.

II. Bone.

Grade.	Constituent valued.	Wholesale price.	Wholesale price plus 20 per cent.
Rough bone,	[Nitrogen,	15.65	18.78
	[Phosphoric acid,..	1.49	1.79
Ground bone,	[Nitrogen,	22.61	26.41
	[Phosphoric acid,..	2.10	2.52

Valuation in Neighboring States.

It is desirable, from all points of view, that the schedule of valuation throughout a district in which similar market conditions prevail, should differ as little as possible. It has been our practice in the past, to conform our schedule to that adopted after very careful co-operative study of market conditions for each year, by the New England States and New Jersey, except where the peculiar conditions of our markets have made the valuations diverge too largely from the actual selling prices, as in the case of ground bone and dissolved rock phosphates. The schedules for these States for 1904 and 1905 are as follows:

Trade Values Adopted by the New England States and New Jersey.

	Cents per pound.		Values in 1905 in per cent. of those of 1904.
	1904.	1905.	
Nitrogen:			
In ammonia salts,	17½	17½	100
In nitrates,	16.0	17.0	106.2
In dry and fine ground fish,	17½	18½	105.7
In meat, blood and mixed fertilizer,	17½	18½	105.7
In fine ground bone and tankage,	17.0	18.0	105.9
In coarse bone and tankage,	12½	13.0	104
Phosphoric acid:			
Water soluble,	4½	4½	100
Citrate soluble,	4½	*4.0	88.8
In cotton seed meal, castor pomace, fine ground fish and wood ashes,	4.0	4.0	100
In fine bone and tankage,	4.0	4.0	100
In coarse bone and tankage,	3.0	3.0	100
In mixed fertilizers, insoluble,	2.0	2.0	100
Potash:			
In forms free from muriate,	5.0	5.0	100
As muriate,	4¼	4¼	100

*Except in New Jersey, where owing to the legal requirements of methods which indicate a less quantity of citrate soluble than is obtained by use of the official method a valuation of 4½ cents per pound has been adopted.

In view of the various facts set forth in the foregoing paragraphs, the schedule adopted for use in New England and New Jersey for the current year has been adopted for use in Pennsylvania also, except with respect to dissolved phosphate rock and ground bones.

For these two classes of fertilizers it is needful, as has been repeatedly set forth, to adopt independent valuations for this Commonwealth. The wholesale market having exhibited no change in the cost of phosphate rock and sulphuric acid, the raw materials used in making dissolved rock phosphates, and the valuations under the schedule of 1904 having agreed well with the selling prices of that year, little change seems needful with respect to these goods. In view of the upward tendencies exhibited by the ammoniate market, the valuations for nitrogen in ground bone are slightly raised.

The schedule for 1905 as a whole is as follows:

Schedule of Values for Fertilizer Ingredients, 1905.

	Cents per pound.
Nitrogen:	
In ammonia salts,	17½
In nitrates,	17
In meat, dried blood and mixed fertilizers,	18½
In cotton seed meal and castor pomace,	16½
In fine ground bone and tankage,	14
In coarse bone and tankage,	12
Phosphoric acid:	
Soluble in water, in bone fertilizers,	4½
Soluble in water, in rock fertilizers,	3
Soluble in ammonium citrate, in bone fertilizers,	4
Soluble in ammonium citrate, in rock fertilizers,	2½
Insoluble in ammonium citrate, in bone fertilizers,	2
Insoluble in ammonium citrate, in rock fertilizers,	1½
In fine bone, tankage and fish,	3
In coarse bone and tankage,	2½
In cotton seed meal, castor pomace and wood ashes,	4
Potash:	
In high grade sulphate or in forms free from muriate,	5
As muriate,	4¼

Potash in excess of that equivalent to the chlorine present, will be valued as sulphate, and the remainder as muriate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphoric acid prices, unless clearly found to be derived from rock phosphate.

Bone is sifted into two grades of fineness: Fine, less than 1-50 inch in diameter; coarse, over 1-50 inch in diameter.

The result obtained by the use of this schedule does not cover the items of mixing, bagging, freight and agents' commission. To cover these, allowances are made as follows:

For freight, an allowance of \$2.00 per ton on all fertilizers.

For bagging, an allowance of \$1.00 per ton on all fertilizers, except when sold in original packages.

For mixing, an allowance of \$1.00 per ton on complete fertilizers and rock-and-potash goods.

For agents' commission, an allowance of 20 per cent. is added to the cash value of the goods ready for shipment.

FERTILIZER ANALYSES, JANUARY 1 TO AUGUST 1, 1905.

Since January 1, 1905, there have been received from authorized sampling agents eleven hundred and sixty fertilizer samples, of which five hundred and forty-three were subjected to analysis, the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received, equal portions from the several samples were united and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 375 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 3 dissolved bones, furnishing phosphoric acid and nitrogen; 86 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 47 acidulated rock phosphates, furnishing phosphoric acid only; 27 ground bones, furnishing phosphoric acid and nitrogen, and 5 miscellaneous samples, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “reverted” acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—this element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (6) In the case of ground bone, the state of subdivision is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depends very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent" is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made this Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	374	82	3	47	27
Moisture, per cent.,	9.72	10.28	5.27	9.84	6.75
Phosphoric acid:					
Total, per cent.,	10.16	11.74	13.14	16.01	22.96
Soluble, per cent.,	4.93	6.50	4.12	10.44	.....
Reverted, per cent.,	3.57	4.12	6.11	4.42	.....
Insoluble, per cent.,	1.66	1.12	2.91	1.15	.....
Potash, per cent.,	4.55	3.34	.....	.....	.....
Nitrogen, per cent.,	1.61	.....	1.75	.....	3.23
Mechanical analysis of bone:					
Fine, .....	.....	.....	.....	.....	70
Coarse, .....	.....	.....	.....	.....	30
Commercial valuation,	25.61	15.49	22.70	13.86	26.87
Average selling price,	24.63	16.11	23.83	13.64	29.08
Commercial value of samples whose selling price is ascertained,	25.60	15.49	22.70	13.86	26.72

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent., or more, were as follows:

Summary of Instances of Deficiency from Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	1	.....	*	.....	.....
Deficient in three constituents,	7	2	.....	.....	.....
Deficient in two constituents,	27	5	1	2	1
Deficient in one constituent,	84	13	1	2	7
Total samples in which deficiency occurred,...	119	21	2	4	8

*Only three samples analyzed.

The cases of deficiency noted during the past thirteen seasons in the goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency, 1899-1905.

	Spring, 1899.	Fall, 1899.	Spring, 1900.	Fall, 1900.	Spring, 1901.	Fall, 1901.	Spring, 1902.	Fall, 1902.	Spring, 1903.	Fall, 1903.	Spring, 1904.	Fall, 1904.	Spring, 1905.
Complete fertilizers, ..	38.4	33.7	42.0	40.8	31.6	34.6	40.0	36.7	37.5	37.9	39.5	49.2	35.3
Dissolved bone,	50.0	14.3	*50.0	*50.0	†	40.0	*100.0	50.0	33.3	63.6	†	50.0	\$100.0
Rock and potash, ...	19.1	34.2	29.2	33.3	31.7	26.2	30.3	43.5	32.9	43.2	50.7	35.3	30.9
Dissolved rock,	13.8	14.5	5.4	19.4	22.5	8.2	15.2	8.9	23.2	20.0	20.0	11.1	9.3
Ground bone,	18.4	25.3	36.7	11.8	34.1	18.2	17.2	25.9	33.3	.....	36.3	36.8	40.0
All classes except miscellaneous,	30.9	29.2	35.2	31.3	30.8	27.6	31.2	33.2	35.1	44.7	39.6	41.4	32.8

*Only two samples analyzed.
†Only one sample analyzed.
‡Only two samples analyzed for which no guaranties are recorded.
§Only two samples analyzed for which guaranties are recorded.

Marked variations in the general percentage of deficiency occur from year to year. The percentage of deficiency of all classes of fertilizers for the present season is less than for several seasons past.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follows:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1901.		
Phosphoric acid:		
Total,	11.51	9.82
Available,	10.00	8.06
Potash,	2.77	2.63
Nitrogen,	1.39	1.33
Spring, 1902.		
Phosphoric acid:		
Total,	10.80	9.29
Available,	8.25	7.82
Potash,	3.90	3.66
Nitrogen,	1.62	1.58
Fall, 1902.		
Phosphoric acid:		
Total,	12.58	11.40
Available,	9.95	9.29
Potash,	2.69	2.60
Nitrogen,	1.57	1.55
Spring, 1903.		
Phosphoric acid:		
Total,	11.90	10.67
Available,	9.36	8.73
Potash,	3.85	3.63
Nitrogen,	1.58	1.61

Average Composition and Guaranty Compared—Continued.

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1903.		
Phosphoric acid:		
Total,	10.76	9.65
Available,	8.84	8.13
Potash,	4.09	3.90
Nitrogen,	1.33	1.29
Spring, 1904,		
Phosphoric acid:		
Total,	10.24	9.32
Available,	8.27	7.87
Potash,	4.09	3.90
Nitrogen,	1.58	1.55
Fall, 1904.		
Phosphoric acid:		
Total,	10.49	9.72
Available,	8.59	7.70
Potash,	2.87	2.81
Nitrogen,	1.25	1.29
Spring, 1905.		
Phosphoric acid:		
Total,	10.16	9.42
Available,	8.50	7.92
Potash,	4.55	4.22
Nitrogen,	1.61	1.58

It is of interest to note how closely the system of valuations, based upon the wholesale prices of raw materials in the principal markets during the most important buying season and upon certain average allowances for expense and profit on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1899-1905.

	Selling price.	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1899, Spring,	\$23.60	\$24.70	\$1.10
Fall,	22.98	23.42	.44
1900, Spring,	25.38	24.61	-.77
Fall,	23.22	23.84	.62
1901, Spring,	23.92	24.76	.84
Fall,	22.28	23.75	1.47
1902, Spring,	24.10	25.33	1.25
Fall,	21.83	23.31	1.48
1903, Spring,	24.57	24.15	-.42
Fall,	21.98	22.77	.79
1904, Spring,	24.28	24.99	.71
Fall,	21.82	22.53	.71
1905, Spring,	24.63	25.60	.97

Comparison of Selling Price and Valuation, 1899-1905—Continued.

	Selling price.	Valuation.	Excess of valuation over selling price.
Dissolved bone:			
1899, Spring,	21.75	21.81	.06
1899, Fall,	19.00	21.12	2.12
1900, Spring,	26.00	30.87	4.87
1900, Fall,	23.50	22.74	-.76
1901, Spring,	28.00	29.00	1.00
1901, Fall,	23.91	23.36	-.55
1902, Spring,	16.50	17.85	.85
1902, Fall,	25.30	27.08	1.78
1903, Spring,	31.17	30.87	-.30
1903, Fall,	23.67	24.57	.90
1904, Spring,	31.50	28.42	-3.08
1904, Fall,	24.94	27.77	2.83
1905, Spring,	23.83	22.70	-1.13
Rock and potash:			
1899, Spring,	16.83	15.16	-1.67
1899, Fall,	17.28	14.53	-2.75
1900, Spring,	17.35	14.71	-2.64
1900, Fall,	18.11	14.63	-3.48
1901, Spring,	16.20	14.60	-1.60
1901, Fall,	16.00	14.23	-1.86
1902, Spring,	16.45	15.05	-1.40
1902, Fall,	15.97	14.46	-1.51
1903, Spring,	17.20	14.74	-2.46
1903, Fall,	15.96	14.86	-1.10
1904, Spring,	16.47	15.46	-1.01
1904, Fall,	15.89	14.92	-.97
1905, Spring,	16.11	15.49	-.62
Dissolved rock:			
1899, Spring,	13.36	14.03	.67
1899, Fall,	12.64	13.13	.49
1900, Spring,	13.57	13.43	-.09
1900, Fall,	13.96	13.11	-.85
1901, Spring,	13.90	13.51	-.39
1901, Fall,	13.18	13.82	.64
1902, Spring,	13.73	13.49	-.24
1902, Fall,	13.54	13.70	.12
1903, Spring,	15.13	13.34	-1.79
1903, Fall,	14.64	13.12	-1.52
1904, Spring,	14.59	14.05	-.54
1904, Fall,	13.89	14.09	.20
1905, Spring,	13.64	13.86	.22
Ground bone:			
1899, Spring,	26.67	28.11	1.44
1899, Fall,	24.98	27.23	2.25
1900, Spring,	28.42	25.91	-2.51
1900, Fall,	28.73	26.87	-1.86
1901, Spring,	27.59	28.71	1.12
1901, Fall,	25.94	27.69	1.75
1902, Spring,	28.52	26.80	-1.72
1902, Fall,	28.09	27.51	-.58
1903, Spring,	28.67	27.25	-1.42
1903, Fall,	27.52	27.07	-.45
1904, Spring,	28.20	27.70	-.50
1904, Fall,	27.02	27.97	.95
1905, Spring,	29.08	26.72	-2.36

FERTILIZER ANALYSES AUGUST 1, TO DECEMBER 31, 1905.

Since August 1, 1905, there have been received from authorized sampling agents ten hundred and fifty-six fertilizer samples, of which four hundred and fifty were subjected to analysis, the remainder being rejected either because they represented brands analyzed last season, or because they were regarded as not certainly representative of the brand whose name they bore. When two or more samples representing the same brand were received equal portions from the several samples were united and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 285 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 6 dissolved bones, furnishing phosphoric acid and nitrogen; 74 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 49 acidulated rock phosphates, furnishing phosphoric acid only; 35 ground bones, furnishing phosphoric acid and nitrogen, and one miscellaneous sample, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total, that portion soluble in water, and of the residue, that portion not soluble in warm ammonia citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “reverted” acid, which is the portion insoluble in water but soluble in the citrate. The sum of the soluble and reverted is commonly called the “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined by a method which simply accounts for all present, without distinguishing between the quantities present in the several forms of ammonium salts, nitrates or organic matter. (5) Chlorin; this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of subdivision is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone

in the soil depends very largely on the fineness of its particles the finer being much more quickly useful to the plant.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of a valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent" is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen.

The law of 1901 abolishes this alternative and requires that the guaranty shall be given in terms of nitrogen. Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables.

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made This Season.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	285	74	6	49	35
Moisture, per cent.,	10.09	10.89	6.15	9.22	5.19
Phosphoric acid:					
Total, per cent.,	10.54	11.47	16.06	15.71	22.59
Soluble, per cent.,	4.51	5.63	4.41	9.05	.....
Reverted, per cent.,	4.20	4.74	5.72	5.07	.....
Insoluble, per cent.,	1.83	1.10	5.93	1.57	.....
Potash, per cent.,	2.93	3.24	.....	.....	.....
Nitrogen, per cent.,	1.26	.....	2.05	.....	2.96
Mechanical analysis of bone:					
Fine, .....	.....	.....	.....	.....	74
Coarse, .....	.....	.....	.....	.....	26
Commercial valuation,	22.45	15.05	25.85	13.34	28.70
Average selling price,	21.39	15.97	24.78	12.21	27.70
Commercial value of samples whose selling price is ascertained,	22.35	15.04	25.85	13.51	28.70

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent. or more, were as follows:

Summary of Instances of Deficiency From Guaranty.

	Complete fertilizers.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Deficient in four constituents,	2	.....	.....	.....	.....
Deficient in three constituents,	1	1	1	.....	.....
Deficient in two constituents,	35	6	1	2	.....
Deficient in one constituent,	69	17	2	3	11
Total samples in which deficiency occurred, ..	107	24	4	5	11

The cases of deficiency noted during the past thirteen seasons in the goods as compared with their guaranties expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency, 1899-1905.

	Springs, 1899.	Fall, 1899.	Springs, 1900.	Fall, 1900.	Springs, 1901.	Fall, 1901.	Springs, 1902.	Fall, 1902.	Springs, 1903.	Fall, 1903.	Springs, 1904.	Fall, 1904.	Springs, 1905.	Fall, 1905.
Complete fertilizers,	38.4	33.7	42.0	40.8	31.7	34.6	40.0	36.7	37.5	37.9	39.5	49.2	35.3	37.5
Dissolved bone,	50.0	14.3	*50.0	*50.0	†	40.0	*100.0	50.0	33.3	63.6	†	50.0	\$100.0	66.6
Rock and potash,	19.1	34.2	29.2	33.3	31.7	26.2	30.3	43.5	32.9	43.2	50.7	35.3	30.9	33.0
Dissolved rock,	13.8	14.5	5.4	19.4	22.5	8.2	15.2	8.9	23.2	20.0	20.0	11.1	9.3	10.0
Ground bone,	18.4	25.3	36.7	11.8	34.1	18.2	17.2	25.9	23.3	.....	36.3	36.8	40.0	31.4
All classes except miscellaneous,	30.9	29.2	35.2	34.3	30.8	27.6	34.2	33.2	35.1	44.7	39.6	41.4	32.8	31.4

*Only two samples analyzed.
†Only one sample analyzed.
‡Only two samples analyzed for which no guaranties are recorded.
§Only two samples analyzed for which guaranties are recorded.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past including those of this season follows:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Fall, 1901.		
Phosphoric acid:		
Total,	11.51	9.82
Available,	10.60	8.06
Potash,	2.77	2.65
Nitrogen,	1.39	1.39
Spring, 1902.		
Phosphoric acid:		
Totals,	10.89	9.29
Available,	8.25	7.82
Potash,	3.90	3.66
Nitrogen,	1.62	1.53
Fall, 1902.		
Phosphoric acid:		
Total,	12.58	11.40
Available,	9.95	9.29
Potash,	2.69	2.60
Nitrogen,	1.57	1.55
Spring, 1903.		
Phosphoric acid:		
Total,	11.99	10.67
Available,	9.36	8.72
Potash,	3.85	3.63
Nitrogen,	1.58	1.61
Fall, 1903.		
Phosphoric acid:		
Total,	10.76	9.65
Available,	8.84	8.13
Potash,	4.09	3.99
Nitrogen,	1.33	1.29
Spring, 1904.		
Phosphoric acid:		
Total,	10.24	9.32
Available,	8.27	7.87
Potash,	4.09	3.90
Nitrogen,	1.58	1.55
Fall, 1904.		
Phosphoric acid:		
Total,	10.49	9.72
Available,	8.59	7.70
Potash,	2.87	2.81
Nitrogen,	1.25	1.29
Spring, 1905.		
Phosphoric acid:		
Total,	10.76	9.42
Available,	8.50	7.92
Potash,	4.55	4.22
Nitrogen,	1.61	1.58
Fall, 1905.		
Phosphoric acid:		
Total,	10.63	9.62
Available,	8.72	8.13
Potash,	2.90	2.42
Nitrogen,	1.26	1.20

It is of interest to note how closely the system of valuations, based upon the wholesale prices of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profit on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1899-1905.

	Selling price	Valuation.	Excess of valuation over selling price.
Complete fertilizers:			
1899, Spring,	\$23.60	\$24.70	\$1.10
Fall,	22.98	23.42	.44
1900, Spring,	25.38	24.61	-.77
Fall,	23.22	23.84	.62
1901, Spring,	23.62	24.76	.84
Fall,	22.28	23.75	1.47
1902, Spring,	24.10	25.33	1.25
Fall,	21.83	23.31	1.48
1903, Spring,	24.57	24.15	-.42
Fall,	21.98	22.77	.79
1904, Spring,	24.28	24.99	.71
Fall,	21.82	22.53	.71
1905, Spring,	24.63	25.60	.97
Fall,	21.39	22.35	.96
Dissolved bone:			
1899, Spring,	21.75	21.81	.06
Fall,	19.60	21.12	2.12
1900, Spring,	26.00	30.87	4.87
Fall,	23.50	22.74	-.76
1901, Spring,	28.00	29.00	1.00
Fall,	23.91	23.96	-.55
1902, Spring,	16.50	17.35	.85
Fall,	25.30	27.03	1.78
1903, Spring,	31.17	30.87	-.30
Fall,	23.67	24.57	.90
1904, Spring,	31.50	28.42	-3.08
Fall,	21.94	27.77	2.83
1905, Spring,	23.83	22.70	-1.13
Fall,	24.78	25.85	1.11
Rock and potash:			
1899, Spring,	16.83	15.16	-1.67
Fall,	17.28	14.53	-2.75
1900, Spring,	17.35	14.71	-2.64
Fall,	18.11	14.63	-3.48
1901, Spring,	16.20	14.60	-1.60
Fall,	16.00	14.23	-1.86
1902, Spring,	16.45	15.05	-1.40
Fall,	15.97	14.46	-1.51
1903, Spring,	17.20	14.74	-2.46
Fall,	15.96	14.86	-1.10
1904, Spring,	16.47	15.46	-1.01
Fall,	15.89	14.92	-.97
1905, Spring,	16.11	15.49	-.62
Fall,	15.97	15.04	-.97
Dissolved rock:			
1899, Spring,	13.36	14.03	.67
Fall,	12.64	13.13	.49
1900, Spring,	13.57	13.48	-.09
Fall,	13.96	13.11	-.85
1901, Spring,	13.96	13.11	-.85
Fall,	13.58	13.82	.64
1902, Spring,	13.73	13.40	-.24
Fall,	13.54	13.70	.12
1903, Spring,	15.13	13.34	-1.79
Fall,	14.64	13.12	-1.52
1904, Spring,	14.59	14.05	-.54
Fall,	13.89	14.09	.20
1905, Spring,	13.64	13.86	.22
Fall,	12.21	13.51	1.30

Comparison of Selling Price and Valuation, 1899-1905.—Continued.

	Selling price.	Valuation.	Excess of valuation over selling price.
Ground bone:			
1899, Spring,	26.67	28.11	1.44
1899, Fall,	24.98	27.23	2.25
1900, Spring,	28.42	25.91	-2.51
1900, Fall,	28.73	26.87	-1.86
1901, Spring,	27.59	28.71	1.12
1901, Fall,	25.94	27.69	1.75
1902, Spring,	28.52	26.80	-1.72
1902, Fall,	28.00	27.51	-.51
1903, Spring,	28.67	27.25	-1.42
1903, Fall,	27.52	27.07	-.45
1904, Spring,	28.20	27.70	-.50
1904, Fall,	27.01	27.97	.95
1905, Spring,	29.08	26.72	-2.36
1905, Fall,	27.70	28.70	1.00

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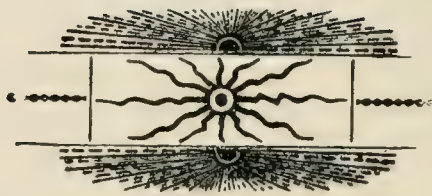
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INDEX BY AUTHORS.

	Page.
A.	
AMOSS, HON. W. L., An address,	298
ANDERSON, DR. H. B., Farm hygiene,	663
B.	
BAILEY, C. M., City milk supply,	715
BARKER, PROF. G. M., The necessity and value of an education,	614
BARCLAY, RICHARD D., Education in apiculture,	703
BEAVER, GEN. JAMES A., An address,	402
BENDER, REV. W. H., Honey-bee flora of Adams county,	712
BENTON, FRANK, Improvement in honey-bees,	705
BAYLE, PROF. SAMUEL B., Advantages to be derived from the centralization of town- ship schools,	253
BREED, IVY M., The mission of birds,	634
BROWN, A. M., The three systems of orchard management,	562
BUCKHOUT, PROF. W. A., Report of Botanist,	358
BOYER, J. F., Report of Committee on Fruit and Fruit Culture,	361
C.	
CHUBBUCK, E. E., When shall we leave the farm,	394
COLLINGWOOD, H. W., The business of the small fruit grower,	558
COOKE, PROF. WELLS W., The proper theory of farm fertilization,	216
COOK, H. E., An address,	409
Barn construction and sanitation,	457
Barn ventilation,	520
COWAN, B. O., Profitable cattle,	791
CRITCHFIELD, HON. N. B. (Secretary of Agriculture):	
Report of,	3
Evidences of progress,	3
Difficulties to be overcome,	4
Helpful agencies,	5
Feeding stuffs control,	7
Linseed oil,	8
Commercial fertilizers,	9
Suggestions for improvement,	10
State Fair,	11
Address of welcome at Normal Institute,	169
Prefatory to subject of bee-keeping,	671
Address before joint meeting of Dairy Union and Breeders' Association,	753
CROPP, MRS. GERTRUDE, The education of the boys and girls on the farm,	656
D.	
DAVIS, MISS ELLA S., Our opportunities,	626
DEMMING, COL. H. C., Report of Mineralogist,	418
Report of Geologist,	451
DETRICH, DR. J. D., Chalk talk on the dairy cow,	451
DYE, HON. FRANKLIN, An address,	199
E.	
ESCHBACH, I. A., Report of Committee on Cereals and Cereal Crops,	483
F.	
FENSTERMAKER, P. S., Report of Committee on Roads and Road Laws,	389
FINCH, MISS NORA J., Culture on the farm,	648
FRANCE, HON. N. E., Foul brood and other diseases of bees,	691
FRANTZ, MYRTA, Strawberry culture,	636
FREAR, DR. WILLIAM, Report of Chemist,	438
FRESHKORN, ETTA, To be a citizen,	641
FULLER, O. C., Bee-keeping as a business,	694
FUNK, DR. J. H., Spraying; when, how and what for,	185
Report of Pomologist,	380

G.

Page.

GROFF, DR. GEO. G., The farm and public health,	416
---	-----

H.

HAMILTON, PROF. JOHN, Farmers' Institutes, their value and their place in public education,	241
An address,	405
HARTER, MISS MAE L., The true heroine,	640
HAZEN, MRS. A. P., The successful farmer's wife,	660
HERSHBERGER, E. A., Success,	633
HIESTER, GABRIEL, Address at meeting of Horticultural Association,	555
The bee and horticulture,	698
HILLS, PROF. J. L., Some things science has done of late for dairying,	744
The feeding of animals,	771
HOARD, GOVERNOR, Dairy inspection,	731
Some things in cross breeding,	784

J.

JOHNSON, WM. J., An address,	200
JONES, S. MORRIS, Why not more roses,	601

K.

KAUFFMAN, MRS. ISREAL M., Farm life,	646
KEMMERER, LOTTIE, The farm,	620
KIPP, MRS. JESSIE, Culture in the home,	650
KNUPPENBURG, D. A., Report of Committee on Live Stock,	386
KUHNS, MISS LOLA, The farmer's daughter,	658

L.

LANE, C. B., Some phases of the dairy interest,	736
LIE, ROSS F., Experiments with standard home made insecticides for the San José Scale,	582
LEFEVRE, F. C., Tests of commercial insecticides,	579
LONSDALE, EDWIN, Report of Committee on Floriculture,	468

M.

MARTIN, HON. A. L. (Deputy Secretary and Director of Farmers' Institutes):	
Report of,	13
Program Normal Institute,	14
List county chairmen,	17
List State speakers,	19
Attendance institutes, 1904-5,	22
List of speakers and their assignments,	30
List of speakers and their subjects,	39
Crop report for 1905,	52
List of agricultural societies,	59
McDOWELL, PROF. M. S., Methods of institute work,	256
McGOWAN, H. G., Report of committee on fertilizers,	465
MATTHEWS, DELROY, Education of farmers' boys,	652
MENGES, PROF. FRANKLIN, The advantages of corn breeding to the Pennsylvania farmer,	307
Report of Entomologist,	473
MILLER, PROF. N. G., Organization of the San José Scale work by the Division of Zoology of Pennsylvania,	574

N.

NELSON, J. W., Report of Committee on Apiary,	512
NORTON, HON. W. C., Report on State Fair,	769

O.

ORR, T. E., Poultry breeding and specialty breeding,	288
--	-----

P.

Page.

PEARSON, DR. LEONARD (State Veterinarian):

Report of,	13
Work of State Live Stock Sanitary Board,	103
Tuberculosis of cattle,	105
Veterinary Congress in Albany,	107
Relation of State Live Stock Sanitary Board to the dairy interests of the State,	109
Laws relating to work of State Live Stock Sanitary Board,	111
Diseases of horses,	115, 117
Hog cholera,	119
Rabies,	119
PEACHEY, J. H., What shall we teach?	332
PENNYPACKER, GOV. S. W., An address,	507
PENNYPACKER, CHARLES H., Address of welcome, Normal Institute,	167
PHILLIPS, EVERETT F., The habits of the bee and some misapprehensions,	679
PITZER, MRS. J. L., Farming and fruit growing in the South,	644
PRATT, JOHN P., The Swarthmore demonstrations,	701

R.

RAY, JOHN P., The Merino; its utility and development,	777
RICHARDS, J. C., A talk about farmers' wives,	654
ROBINSON, P. F. R., Soil bacteria and cultures—their relation to leguminous plants,	204
ROHR, MRS. JENNIE R., Is it lasting benefit for women to help with outdoor work?	638
ROTHROCK, DR. J. T., State consumptive camps,	176
ROUNDSLY, JAMES, Agriculture abroad,	616

S.

SAMPSON, PROF. H. O., Agricultural education,	621
Some soil properties and their relation to crop production,	629
SHAW, PROF. THOMAS, An address,	408
Breeding live stock on the farm,	426
Feeding farm animals,	433
SHARPLESS, THOMAS, The cultivation of mushrooms,	231
STOUT, W. H., The county chairman and institute lecturer,	283
Report of Geologist,	455
SURFACE, PROF. H. A. (Economic Zoologist):	
Report of,	129
Work of Division,	130
Publications,	133
Demonstrations,	134
Nurseries licensed in State,	135
Nurseries, licensed tree dealers,	139
Inspection of plants,	141
Marking collections,	142
School collections,	143
Birds and insects,	217
Report of Ornithologist,	418
San José Scale; how it travels,	570
Introductory address, Bee-keepers Association,	672
First Annual Address as President, Bee-keepers' Association,	674

T.

TAYLOR, D. S., Report of Committee on Wool and Textile Fibres,	392
TAYLOR, PROF. WM. A., The pomological investigations of the United States Department of Agriculture,	595
TEMPLE, N. G., Report of Committee on Poultry,	517
TOWER, DR. E. E., Care and handling of farm animals,	486

V.

VAN NORMAN, PROF. H. E., What dairymen are doing,	723
---	-----

W.

WAITE, PROF. M. B., Fungus diseases of orchard trees and fruits,	589
WALLACE, MRS. MARY A., Consolidation of rural schools,	234
WARREN, DR. H. B. (Dairy and Food Commissioner):	
Report of,	64
Question of constitutionality of law,	64
Supreme Court decision on liquor cases,	65
Chemical laboratory established,	68
Prosecutions and court cases,	70

	Page.
Receipts from licenses, 1905,	72
Need of national legislation,	73
Adulteration of fruit syrups,	76
Adulteration of candy and jellies,	79
Diseased meat,	80
The patent medicine problem,	84
Increase demand for pure milk,	86
How oleo is made,	92
Use of butter colors,	93
Fraudulent dairy practice,	94
Cold storage eggs and poultry,	95
Food examination in England,	98
Legal phases of work of Division,	99
WATSON, PROF. G. C., Feeding swine,	338
WATTS, PROF. R. L., Growing early vegetable plants,	301
WELD, R. J., Report of Committee on Dairying and Dairy Products,	422
WILLIAMS, I. C., Report of Committee on Forestry,	475
WING, WILLIS O., Alfalfa in the east,	756

INDEX BY SUBJECTS.

A.

	Page.
Agriculture, evidence of progress,	3
Agriculture, difficulties to be overcome, ..	4
Agriculture, suggestions for improve- ment,	10
Agricultural societies, list of,	59
Agriculture abroad,	616
Agricultural education,	621
Agricultural vs. Industrial and Commer- cial Supremacy of the Republic,	623
Alfalfa in the east,	756
Alfalfa, fertilizing value of,	757
Alfalfa, remarks of Gov. Hoard on,	763
Anthrax,	117
Apiary, the,	512
Apiculture, education in,	703
Appendix,	799

B.

Barn, the construction of,	457
Barn, discussion on,	463
Barn, ventilation of,	520
Barn, construction of flues of,	521
Barn, questions relative to,	523
Bee-keepers' Association, introductory, ..	612
Bee-keepers' Association, officers of,	669
Bee-keepers' Association, constitution of, ..	669
Bee-keepers' Association, prefatory,	671
Bee-keepers' Association, first annual address of President,	674
Bee-keeping in the public schools,	676
Bee-keeping and producers and merchants, ..	677
Bee-keeping, legislation suggested,	677
Bee-keeping as a business,	694
Bee-keeping, the Swarthmore demonstration,	703
Bee-keeping, improvement in the honey-bee,	705
Bee-keeping, selection of breeds and queens,	705
Bee-keeping, honey-bearing flora of Adams county,	712
Birds and insects,	317
Birds, legislation regulating killing of, ..	419
Birds, how to prevent robins from eating fruit,	420
Birds, mission of,	634
Botanist, report of,	358
Butter colors, use of,	93
Butter prices for 1905,	99

C.

Cereals, Report of Committee on,	483
Citizen, what is it to be a true,	641
Citizen, definition of,	642
Corn, breeding of, advantages to farmers,	307
Corn, breeding of, the ear and kernel,	308
Corn, breeding of, testing the vitality of,	309
Consumption not cured by drugs,	177

	Page.
Consumption, treatment of at Mont	
Alto,	178
Consumptive camps,	176
Consumptive sanitariums, reasons for es- tablishing on State reservations,	180
Cow, the dairy,	322
Cow, the dairy, selection of,	323
Cow, the dairy, breeding of,	327
Crop, report of, 1905,	52

D.

Dairy and Food Division, Report of Commissioner,	64
Dairy and Food Division, decision of Superior Court on liquor cases,	65
Dairy and Food Division, chemical laboratory established,	63
Dairy and Food Division, prosecutions and court cases,	70
Dairy and Food Division, receipts of 1907,	72
Dairy and Food Division, need of a national law,	73
Dairy and Food Division, canned goods, ..	75
Dairy and Food Division, adulteration, ..	79
Dairy and Food Division, enforcement of oleo law,	83
Dairy and Food Division, legal phases of work,	99
Dairy products, Report of Committee on,	422
Dairy Union, meeting and officers of,	715
Dairying, fraudulent practices of,	94
Dairying, Pennsylvania's place in,	723
Dairying, profit in,	724
Dairying, some phases of as an industry,	736
Dairying, products of improving,	736
Dairying, practical results of experiment,	737
Dairying, the man behind the cow,	741
Dairying, the milking machine,	741
Dairying, U. S. Dept. of Agri, getting closer to dairymen,	743
Dairying, some things science has done for,	744
Dairy inspection,	731
Dairymen, what they are doing,	723
Department of Agriculture, official list of,	1
Department of Agriculture, Report of Secretary,	3
Department of Agriculture, Report of Deputy Secretary,	13
Department of Agriculture, publications of,	801

E.

Education, value of,	611
Eggs, cold storage,	9
Entomologist, Report of,	473

F.		I.	
	Page.		Page.
Farm, when shall we care for the,	394	Insecticides, home made,	582
Farm, wrong idea of the,	395	Insecticides, tests with,	579
Farmer, the, and public health,	416	Institutes, farmers', program Normal in-	
Farmer, the real,	620	stitute,	11
Farmers' wives,	651	Institutes, farmers', list county chairmen, ..	14
Farmer boys and girls, education of,	656	Institutes, farmers', State speakers,	19
Farmers' daughters,	658	Institutes, farmers', attendance, 1904-5,..	22
Farmer's wife, the successful,	669	Institutes, farmers', assignments,	39
Farm customs,	648	Institutes, farmers', subjects,	39
Farm fertilization, proper theory of,	216	Institutes, farmers', their value and their	
Farm fertilization, questions relating to, ..	230	place in public education,	241
Farming, change in conditions of,	244	Institutes, farmers', organization of,	243
Farming, woman and outdoor work,	638	Institutes, farmers', supply a need,	262
Farming in the South,	644	Institutes, farmers', methods of work,..	256
Farm hygiene,	663	Institutes, farmers', county chairmen and	
Farm animals, care and handling of, ..	486	lecturers,	283
Farm animals, diseases of cattle,	487	Institutes, farmers', papers read at,	611
Farm animals, diseases of horses,	489		
Farm animals, importance of stable con-			
struction for,	490		
Farm animals, treatment of,	491		
Farm animals, feeding of,	493		
Farm animals, quality of,	494		
Farm animals, arrested development of,..	496		
Farm animals, over feeding of,	496		
Farm animals, when to sell,	497		
Farm animals, what to feed,	498		
Farm animals, housing of,	500		
Farm animals, discussion on,	501		
Feeding stuffs control, work of,	7		
Feeding stuffs, chemical constituents of, ..	498		
Feeding stuffs made from molasses,	438		
Fertilizers, work of Department,	8		
Fertilizers, valuation of, 1905,	807		
Fertilizers, analyses, spring, 1905,	812		
Fertilizers, analyses, fall, 1905,	821		
Fertilizers, Report of Committee on,	465		
Fertilizers, values of,	466		
Floriculture, Report of Committee on, ..	468		
Forestry, Report of Committee on,	475		
Fruits of Pennsylvania,	381		
Fruit culture, Report of Committee on,..	361		
Fruit culture, insect enemies and reme-			
dies,	381		
Fruit, Report of General Committee,	533		
Fruit, apple crop for 1905,	539		
Fruit, other fruit crops,	541		
Fruit, small fruit crops,	541		
Fruit, observations in the State,	545		
Fruit Growers' Association of Adams			
County,	560		
Fruit growing in State,	555		
Fruit growing, business of small fruit			
grower,	558		
Fruit growing, location for small fruit			
growing,	560		
G.		L.	
Geologist, report of Col. H. C. Demming, ..	451	Life, our opportunities in,	626
Geologist, report of W. H. Stout,	453	Life, success in,	633
Geologist, description of quartz and peat, ..	451	Linseed oil, law on,	8
Geologist, classification of strata,	455	List of Department officials,	1
Glanders, increasing in State,	115	List of agricultural societies,	59
Grange, officers of,	838	Live stock on farm, breeding of,	426
		Live stock on farms, laws governing	
		breeding,	426
		Live stock, prepotency of sire,	427
		Live stock, promiscuous breeding,	471
		Live stock, feeding of,	771
		Live stock, some things in cross breeding, ..	784
		Live stock, summary in cross breeding,..	789
		Live stock, profitable cattle,	791
		Live stock, pioneer breed of,	793
		Live stock, crazes in business,	795
		Live stock, Shorthorn claims,	795
		M.	
		Milk supply of Philadelphia,	87
		Milk, healthful,	87
		Milk, preservatives in,	88
		Milk, city supply of,	715
		Milk, sanitary,	716
		Milk, commercial,	716
		Milk, shipping of,	717
		Milk, old methods of handling,	718
		Milk, inspection of,	723
		Mineralogy, report of Mineralogist,	418
		Mineralogy, minerals mined in State, ..	418
		Molasses feeds,	418
		Mushrooms, cultivation of,	231
		N.	
		Nurseries licensed in the State,	135
		Nurseries, tree agents in the State,	139
		O.	
		Official list,	1
		Oleomargarine, laws enforced,	89
		Oleomargarine, number of licenses is-	
		sued,	90
		Oleomargarine, how made,	92
		Orchard management,	562
		Orchard fruits and trees,	589
		P.	
		Pomology, report of Pomologist,	380
		Pomology, investigations of United States	
		Department of Agriculture,	595
		Pomology, field investigations,	596
		Poultry, cold storage,	96
II.			
Home, culture in the,	650		
Honey-bee, habits and some misappre-			
hensions of,	679		
Honey-bee, difficulties in the study of,..	673		
Honey-bee, foul brood and other diseases			
of,	691		
Honey-bee and horticulture,	69		
Honey-bee, selection of breed,	705		
Honey-bee, selection of queen,	707		
Horses, diseases of,	115		

	Page.		Page.
Poultry, profitable,	96	State Board of Agriculture, proceedings	
Poultry, breeding as a speciality,	288	of spring meeting, 1905,	115
Poultry, classification of,	290	State Board of Agriculture, proceedings	
Poultry, Report of Committee on,	517	annual meeting, 1906,	346
R.			
Rabies, prevalence of,	119	State Board of Agriculture, members and	
Rabies, control of,	120	officers of,	349
Resolutions adopted at Normal Institute,	343	State Board of Agriculture, minutes of,	355
Resolution endorsing Adams bill,	398	State Board of Agriculture, Report of	
Report of Secretary of Agriculture,	3	Botanist,	358
Report of Deputy Secretary,	14	State Board of Agriculture, Report of	
Report of crops for 1905,	52	Committee on Fruit,	361
Report of Dairy and Food Commissioner,	64	State Board of Agriculture, Report of	
Report of State Veterinarians,	103	Committee on Credentials,	374
Report of Economic Zoologist,	129	State Board of Agriculture, Report of	
Report of Botanist,	358	Pomologist,	380
Report of Committee on Fruits,	361	State Board of Agriculture, Report of	
Report of Committee on Roads and Rail		Committee on Live Stock,	386
Laws,	386	State Board of Agriculture, Report of	
Report of Pomologist,	380	Committee on Roads,	389
Report of Committee on Live Stock,	386	State Board of Agriculture, Report of	
Report of Committee on Wool,	392, 418	Committee on Wool,	392
Report of Ornithologist,	418	State Board of Agriculture, Report of	
Report of Committee on Dairy,	422	Onithologist,	418
Report of Chemist,	438	State Board of Agriculture, Report of	
Report of Mineralogist,	418	Committee on Dairy,	422
Report of Geologists,	451, 455	State Board of Agriculture, Report of	
Report of Committee on Fertilizers,	465	Chemist,	438
Report of Committee on Floriculture,	468	State Board of Agriculture, Report of	
Report of Committee on Legislation,	472	Mineralogist,	418
Report of Committee on Forestry,	475	State Board of Agriculture, Report of	
Report of Committee on Cereals,	483	Geologists,	451, 455
Report of Committee on Identification of		State Board of Agriculture, Report of	
Fruits,	546	Committee on Fertilizers,	465
Report of Committee on Apiary,	512	State Board of Agriculture, Report of	
Report of Committee on Poultry,	517	Committee on Floriculture,	468
Report of Bee-keepers' Association,	667	State Board of Agriculture, Report of	
Road and Road Laws, Report of Commit-		Committee on Legislation,	472
tee on,	389	State Board of Agriculture, Report of	
Roses, why not more,	601	Entomologist,	473
Roses, cultivation of,	602	State Board of Agriculture, Report of	
Roses, diseases of,	603	Committee on Forestry,	475
S.			
San José Scale, how it travels,	570	State Board of Agriculture, Report of	
San José Scale, organization work of Di-		Committee on Cereals,	483
vision of Zoology,	574	State Board of Agriculture, Report of	
San José Scale, tests of insecticides,	579	Committee on Identification of Fruits, ..	509
San José Scale, experiments with insecti-		State Board of Agriculture, Report of	
cides,	581	Committee on Apiary,	512
San José Scale, tabulated statement of		State Board of Agriculture, Report of	
insecticides,	587	Committee on Poultry,	517
Schools, consolidation of rural,	231	State College, remarks relative to,	366
Schools, problem of,	235	State College, faculty of,	
Schools, best plan of consolidation,	235	State College, Experiment Station, offi-	
Schools, woman's interest in,	239	cers of,	835
Schools, centralized township,	253	State Dairy Union, meeting of,	715
Schools, economic management of,	255	State Dairy Union, officers of,	715
Sheep, the Merino and its development, ..	777	State Dairy Union, papers read at annual	
Sheep, the breed,	779	meeting of,	715
Sheep, principles of governing,	781	State Dairy Union, joint meeting State	
Soil bacteria, relation to leguminous		Live Stock Association,	753
plants,	204	State Fair, Report of Committee on,	769
Soil bacteria, must be distributed,	207	State Horticultural Association, proceed-	
Soil bacteria, conditions under which		ings of annual meeting,	535
inoculated,	208	State Horticultural Association, officers of, ..	537
Soil bacteria, experiments,	210	State Live Stock Breeders' Association,	
Soil properties, their relation to crop pro-		joint meeting with Dairy Union,	753
duction,	629	State Live Stock Breeders' Association,	
Soil fertility,	431	officers and papers read at annual meet-	
Spraying, how and what for,	185	ing,	769
Spraying, what is,	186	State Live Stock Sanitary Board, work of, ..	103
Spraying, when to spray,	187	State Live Stock Sanitary Board, officers	
Spraying, machines for,	187	of,	821
Spraying, mixtures for,	190	State Live Stock Sanitary Board, laws re-	
		lating thereto,	111
		State Grange, officers of,	836
		Swine, diseases of,	119
		Swine, feeding of,	338
		Swine, history of,	338
		Swine, meat production of,	340

T.		W.	
	Page.		Page.
Tuberculosis, control of,	121	Woman, the true heroine,	640
Tuberculosis, Koch's opinion,	123	Woman, does it pay for her to do outdoor work,	638
V.		Wool, Report of Committee on,	392
Vegetables, growing of early plants,	201	Z.	
Vegetables, the seed supply,	202	Zoologist, Report of Economic,	129
Vegetables, soil for,	203	Zoologist, work and investigations of, ...	129, 130
Vegetables, dates for sowing seed,	204	Zoologist, publications of,	133
Vegetables, transplanting of,	205	Zoologist, inspections and demonstrations,	134
Veterinarian, Report of,	103	Zoologist, making collections,	142
Veterinary Congress,	107		

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